MISSOURI INTEGRATED WATER QUALITY REPORT AND SECTION 303(d) LIST, 2014

Clean Water Act Sections 303(d), 305(b), and 314

MISSOURI DEPARTMENT OF NATURAL RESOURCES

WATER PROTECTION PROGRAM

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EXECUTIVE SUMMARY

The Missouri Integrated Water Quality Report was prepared by the Missouri Department of Natural Resources (MDNR, or Department) to meet requirements stated in sections 303(d), 305(b), and 314 of the federal Clean Water Act. Section 303(d) requires states to submit a list of waters not meeting water quality standards. Sections 305(b) requires an assessment of surface water quality and summary of monitoring and pollution control activities. Section 314 requires a status and trends assessment of publicly owned lakes. The primary purpose of this report is to provide the United States Environmental Protection Agency and the residents of Missouri with an update on the condition of surface water quality in the state.

Data used in this report were generated through the Department's monitoring activities, and the work of other agencies and organizations operating in conjunction with the Department or independently. Data were assessed using procedures contained in the Department's 2014 Listing Methodology Document (LMD). Monitoring and assessment mainly focused on classified lakes (303,014 acres) and streams (24,491 miles) throughout Missouri.

The 2014 section 303(d) list of impaired waters requiring total maximum daily load studies was approved by the Missouri Clean Water Commission (CWC) on April 2, 2014. This list includes 381 water body-pollutant pairs for both classified and unclassified waters. Common pollutants included bacteria, heavy metals, low dissolved oxygen in water, and mercury in fish tissue. Most common pollutant sources included nonpoint source runoff (agriculture, urban, rural, unspecified nonpoint sources), mining related impacts, atmospheric deposition, and municipal wastewater treatment plants (WWTPs) and other point sources. Thirty-one water body-pollutant pairs listed in the 2012 Section 303(d) were removed from the 2014 list.

For the 2014 reporting cycle, data were available to assess approximately 10,473 miles of classified streams and 188,142 acres of classified lakes. Of those streams, data indicated 4,814 miles (46 percent) fully supported designated uses that were assessed, while 5,659 miles (54 percent) were found to be impaired for at least one designated use. Major causes for impaired uses included bacteria, low dissolved oxygen, mercury in fish tissue, heavy metals, and limited aquatic macroinvertebrate communities. Major sources of impaired uses included urban and agricultural nonpoint source pollution, municipal point sources, and mining activities. For classified lakes, 188,142 acres (73 percent) fully supported their designated uses that were assessed, while 70,372 acres (27 percent) were impaired for one or more designated uses. Primary causes of impaired uses in lakes included nutrients, chlorophyll-a, and mercury in fish tissue. Major pollutant sources included urban and agricultural nonpoint source pollution, atmospheric deposition, and municipal point sources.

Trophic status was summarized for 227 lakes (269,193 ac.), where 13 lakes (757 ac.) were classified as oligotrophic; 48 lakes (85,107) were mesotrophic; 136 lakes (178,917 ac.) were eutrophic; and, 30 lakes (4,412 ac.) were hypereutrophic. The most notable lake trend was observed in the Ozark Highlands region, where decreasing levels of nutrients and mineral turbidity were observed.

PART A: INTRODUCTION

A.1. Reporting Requirements

This report, *Missouri Integrated Water Quality Report for2014,* was prepared by the Department to fulfill reporting requirements contained in sections 303(d), 305(b), and 314(a) of the federal Clean Water Act (CWA). CWA Section 303(d) requires each state to identify waters not meeting established water quality standards, and which also lack an approved Total Maximum Daily Load (TMDL) study or a permit requiring adequate pollution control. Water bodies that are on the 303(d) list are commonly known as "impaired waters." CWA Section 305(b) requires states to submit information pertaining to the overall status of its surface waters, provide a description of programs used to monitor and manage water quality and abate any pollution sources. Section 305(b) is also an opportunity to include a description of groundwater quality in the state, and any related monitoring and protection programs. Under Section 314(a), each state is required to provide an assessment of the water quality of all publicly owned lakes, including a description of their status and trends.

The 2014 Missouri Integrated Report is based on USEPA's *Guidance for 2006, Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act* supplemented by memorandums from the Office of Wetlands, Oceans, and Watersheds concerning CWA Sections 303(d), 305(b), and 314 integrated reporting and listing decisions for the 2006, 2008, 2010, 2012 and 2014 reporting cycles. Under the CWA, the Department is required to report the quality of the state's waters every two years to the USEPA. The USEPA compiles all state reports and prepares a summary for the United States Congress on the nation's waters. The report may then be used for rule making, budget appropriations, and program evaluations by federal legislators.

Missouri has a vast network of water resources that are a key component to a higher quality way of life in the state. This network of streams, lakes, and wetlands helps support our energy needs, sustains farming and industrial operations, provides habitat to wildlife, offers virtually endless opportunities for recreation, and is a direct source of drinking water for a majority of Missourians. Therefore, the efficacy of the Department's regulatory and conservation work is imperative. In addition to fulfilling federal reporting requirements, information provided herein is intended to help guide future water resource management efforts in the state.

A.2. Changes from Previous Report

For the 2014 reporting cycle, there were no significant revisions to Missouri's water quality standards. Therefore, changes since the last reporting cycle only include updates to the state's LMD, *Methodology for the Development of the 2014 Section 303(d) List in Missouri* (see Appendix A). The 2014 LMD describes both the data that may be used for stream and lake assessments, and the assessment methods used to interpret water quality standards for 303(d) and 305(b) reporting. The Department is responsible for developing the LMD, which includes methods supported by sound science and advocated by leading experts in a variety of aquatic science fields. In accordance with the Code of State Regulations (CSR) at 10 CSR 20-7.050(4)(A), the 2014 LMD underwent a 100-day public comment period and was the focus of at least two stakeholder meetings. The final 2014 LMD was approved by the CWC on May 2, 2012.

There were two major revisions from the 2012 and 2014 LMDs. First, the 2014 LMD included a new bacterial based protection for groundwater, whereby *Escherichia coli* (*E. coli*) counts shall not exceed 126 MPN per 100 mL of water at any time in losing streams. Second, for the 2014 cycle the protection of aquatic life was assessed using newly defined biological criteria for fish and biological data, other than aquatic invertebrates collected using Department protocol.

Biological criteria based on fish included communities from streams of 3rd to 5th order in size. This new assessment method using fish was based on work by Doisey *et al.* (2008), and was only applied to streams from the Ozark ecoregion where habitat data indicated the stream was in good condition. The use of biological data other than aquatic macroinvertebrates (e.g., mussel and crayfish surveys) was limited to statistical comparisons, between reference and test sites, requiring significant results of similarity/dissimilarity to assess attainment of aquatic life. For additional revisions, please see section *C.2.4. Changes to the 2014 Listing Methodology Document.*

A.3. General Overview of the Assessment Approach

The Department's Water Protection Program (WPP) administers several water monitoring programs with the goal of generating enough data to assess all waters of the state. Monitoring is centered on three general approaches: (1) fixed station monitoring; (2) intensive surveys; and, (3) screening level monitoring. WPP monitoring may also be used to support various department initiatives, and respond to problematic issues that emerge. In addition, the Department partners with outside agencies, organizations, and universities to meet its data needs, and it coordinates monitoring among this network to obtain the most comprehensive set of information for assessing state waters. While this approach does not cover all waters of the state, it provides the greatest scope and quality of coverage possible given the availability of resources. Detailed information regarding departmental and external monitoring programs used to satisfy reporting requirements under the CWA can be found in section *C.1. Monitoring Program*.

Designated uses were assessed whenever quality data were available, and previous assessments were updated whenever a sufficient amount of new information became available. In some cases, errors that were discovered in previous assessments were corrected. For assessing use attainment, more recent data (i.e. typically less the 7 years old) is preferred; however, due to resource limitations there are instances where assessments were based on data older than 10 years. Assessments based on older data are made only when that data is considered representative of present conditions.

In general, surface water assessments in this report are largely based on biological, water quality, physical habitat, fish tissue, and toxicity data collected through 2012. Monitoring predominantly utilizes a targeted sampling design that focuses on select waters, and which provides a majority of the data used for water quality based assessments reported here. To a more limited extent, a probabilistic sampling design was used as a secondary approach for assessing state waters. This data is derived from the Missouri Department of Conservation's (MDC) Rapid Assessment Monitoring (RAM) program and is based solely on community level data for fish. The Department, through USEPA's Section 319 Nonpoint Source Grant Program, provides funding to the University of Missouri-Columbia to support two lake monitoring programs, the Statewide Lakes Assessment Program and the Lakes of Missouri Volunteer Program. These data are used to track lake trophic status throughout Missouri, and generate water quality trends for lakes with substantial data.

While surface water assessments are the focus of this report, groundwater information is included as well. The Department's Public Drinking Water Branch is the lead state agency responsible for monitoring groundwater quality in Missouri. Groundwater monitoring information is provided along with a summary of groundwater contamination and an overview of the programs available to prevent or remediate such problems. For additional information about the Public Drinking Water Branch beyond what is presented in this report, please see the Department's website at http://www.dnr.mo.gov/env/wpp/dw-index.htm.

A.4. Organization of Report

Beyond this section, this report is divided into several major parts. Part B contains background information on streams and lakes within the state, describes the Department's water management approach and any programs that protect and improve the quality of surface water, gives an overview of costs and benefits of water management in the state, and provides a summary of important issues affecting water quality and associated management programs. Part C describes ongoing water monitoring programs administered by the Department, methodologies used to make assessment determinations for Section 303(d) listings, and major findings resulting from the assessment process. Part D focuses on the status of groundwater resources in the state and related protection and monitoring efforts. Part E discusses department procedures for public participation and stakeholder involvement in the development of the Section 303(d) list. Appendices at the end of this report are reserved for listing water body specific water quality, Section 303(d) prioritization, and other important supporting documents. Appendix B contains the recently approved 2014 Section 303(d) list of impaired waters in Missouri.

PART B: BACKGROUND

B.1. Total Surface Waters

Missouri is home to slightly more than 6 million people with over one-third of the state's population residing in the metropolitan areas of Kansas City and St. Louis (United States Census Bureau 2013). Both cities are benefitted by the Missouri and Mississippi rivers, two essential rivers of the state. Beyond these great rivers, Missouri's landscape contains a rich network of streams and lakes. These waters are expected to meet the needs of municipal, industrial, and agricultural operations and at the same time serve as sources of safe drinking water, places to recreate, and habitat for an abundance of wildlife.

Classified streams in Missouri total 24,491 miles and classified lakes cover an area of 303,014 acres (Table 1). Classified streams and lakes include those waters listed in Tables G and H of Missouri's Water Quality Standards at 10 CSR 20-7.031. Classified waters are given priority under the Department's current water monitoring program. Unclassified streams contribute another 234,395 miles to Missouri's stream network, while unclassified lakes provide an additional 605,979 acres of surface area. Unclassified streams and lakes refer to waters not listed in Tables G and H, but that are still considered waters of the state. Unclassified waters are afforded protection under Missouri's water quality standards, albeit to a lesser extent than classified waters. In order to be considered a classified wetland under Missouri's Water Quality Standards 10 CSR 20-7.031(1)(F), wetlands must meet criteria established in the *United States Army Corps of Engineers Wetlands Delineation Manual 1987*; however, a defined set of classified wetlands does not exist at this time. Previous work by the Department's Division of Geology and Land Survey estimated wetland coverage in the state to be approximately 624,000 acres (Epperson 1992). In comparison, the United States Fish and Wildlife Service's National Inventory of Wetlands currently estimates approximately 1.4 million acres of wetlands exist in Missouri. This estimate is based on palustrine wetland types that include classified and unclassified streams and lakes, or portions of such. Regardless of the source, only estimates of wetland coverage exist for Missouri at this time, and a more precise measurement is reserved until a classified set of wetlands is formally adopted by the state.

Table 1. Overview of surface waters in Missouri.

Topic	Value	Scale	Source
State population (number)	6,021,988	N.A.	US Census Bureau, 2012 Census
State surface area (sq. miles)	68,742	N.A.	US Census Bureau, 2010 Census
River sub-basins (8-digit HUCs)	66	1:24,000	USGS NHD and USDA NRCS WBD
Classified stream (miles)	24,491	1:24,000	USGS NHD
Perennial (miles)	13,230	1:24,000	USGS NHD
Intermittent (miles)	11,261	1:24,000	USGS NHD
Losing streams (miles)	5,203	1:24,000	USGS NHD
Great Rivers (miles)	1,053	1:24,000	USGS NHD
Springs (number mapped)	4,480	N.A.	MDNR
Classified lakes (acres)	303,014	1:24,000	USGS NHD
Unclassified streams (miles)	234,395	1:100,000	USGS NHD
Unclassified lakes (acres)	605,979	1:100,000	USGS NHD
Freshwater wetlands (acres)	624,000	1:24,000	MDNR DGLS

USGS NHD - United States Geological Survey National Hydrography Data Set; USDA NRCS WBD - United States Department of Agriculture National Resources Conservation Service Watershed Boundary Dataset; MDNR DGLS - Division of Geology and Land Survey.

B.2. Overview of Missouri's Waters

Natural lakes in Missouri are limited to oxbow lakes, sinkhole ponds in karst areas, and open water systems in the wetlands of southeastern Missouri (MDC 2002). Man-made lakes and ponds are common throughout the state. These systems range in size from large reservoirs created for hydroelectric generation and water supply, to small ponds used for livestock watering and recreation. The two largest reservoirs in the state are Lake of the Ozarks (59,520 acres) and Harry S. Truman Reservoir (55,600 acres). Currently, the acreage of unclassified lakes in the state is nearly two-fold that of classified lakes.

The state's stream systems are diverse, and the physical attributes they possess are a direct function of their watershed characteristics. Because of this, Missouri's streams can be grouped into three aquatic subregions, the Central Plains, Ozarks, and the Mississippi Alluvial Basin (Figure 1) (Sowa *et al.* 2005). Each subregion has distinct terrain and geology, a specific set of historical and present day land cover, and streams that share similar structural features and functional processes. Thus, each aquatic subregion contains streams that collectively have unique aquatic assemblages and ecological compositions.

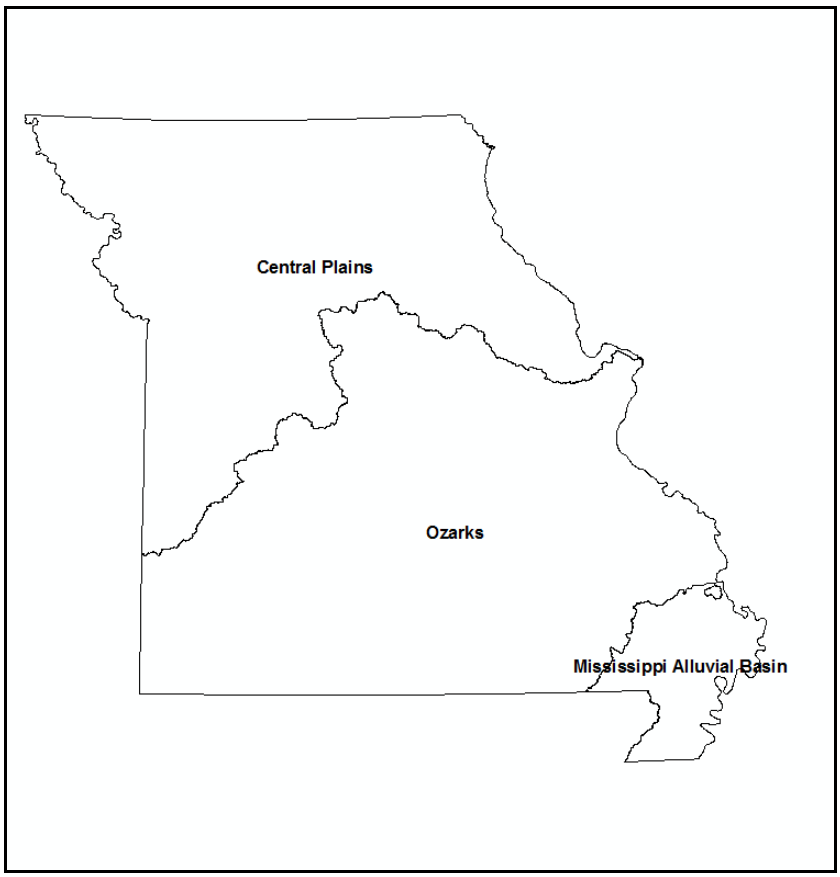

Figure 1. Three Aquatic Subregions of Missouri.

Central Plains of Northern and Western Missouri

The Central Plains occur in the northern half Missouri and extend over to the west-central region of the state. The west-central part of this region once consisted of some of the broadest expanses of prairie while the northern half contained smaller tracts of prairies accompanied by forests in valleys and on steeper slopes (MDC 2002). The land is underlain by bedrock containing several relatively impermeable shale and clay layers. Today this land is dominated by row crops on flattest areas and richest soils, pasture on irregular surfaces, and woods on some of the roughest tracts. Forests of the north are more abundant today than they were historically (MDC 2002).

Surface waters are generally more turbid and greatly affected by high rates of sediment deposition. Soil erosion induced sediment deposition degrades aquatic habitat and stresses aquatic life. Up to 8,000 miles of classified streams may be affected by these processes or other types of degradation of aquatic habitat, such as flow modification or channelization that accompany this region's land use.

Rivers and reservoirs used as drinking water supplies experience contamination from herbicides. In the recent past, several reservoirs that served as public drinking water reservoirs exceeded drinking water standards for atrazine or health advisory levels for cyanazine. Currently, there is just one reservoir listed as impaired for atrazine, Lewistown Lake in Lewis County. Local watershed management programs aimed at reducing herbicide runoff have been fairly effective.

Several other herbicides are occasionally found in drinking water reservoirs, but at concentrations below health advisory levels.

The quality of groundwater in northern and western Missouri is also influenced by the geology of the area. Public water supply sources include reservoirs and wells. The wells obtain water primarily from glacial drift deposits in portions of north-central and western Missouri. Wells in western Missouri, south of Kansas City, obtain water from limestone aquifers, except for the extreme western limits of Missouri near the state border with Kansas. Private water supplies are obtained from glacial drift deposits and from underlying limestone bedrock in portions of northwestern, central, eastern, and northeastern Missouri. However, deep bedrock wells in many north-central and northwestern Missouri locations tap water supplies that are too mineralized for drinking water purposes. It is believed that a minority of private wells in this part of Missouri may exceed the drinking water standard for nitrate, and a very small number for pesticides. This contamination is often caused by localized surface contamination of the wellhead and does not represent widespread contamination of the underground aquifer. Deeper aquifers are normally protected from surface contamination by impermeable strata.

The Ozarks

The hilly topography of the Ozarks region contains areas with the greatest relief in the state. Presettlement vegetation was dominated by forests to the east, woodlands in the central and west Ozarks, and prairies in the outer extent of the subregion. Currently, the eastern Ozarks is dominated by forest cover whereas the western Ozarks have considerably more land in crops and pasture, with woods on steeper terrain. The bedrock, consisting of limestone, dolomite, and sandstone yields groundwater of excellent quality, and is generally adequate in supply for most urban, industrial, and other needs. The soil or subsoil has developed from weathering of bedrock formations and is generally 20 to 80 feet thick. Some areas have extremely thin soils, and in locations where weathering has been extensive, soils may be 100 feet thick or more. The subsoil has moderate to high infiltration rates, which help contribute to the recharge of groundwater supplies. Streams are typically entrenched into bedrock and influenced to some degree by groundwater flow from large springs (MDC 2002). Losing streams, those that lose flow through the stream bed to underground, occur in karst regions of the Ozarks.

Ozark streams are generally clear, with baseflows well sustained by many seeps and springs. Some streams and reservoirs in the Ozarks are becoming nutrient and algae enriched due to increasing human population and domestic animal production in their watersheds.

Groundwater contamination risks are moderate to high due to the permeability of the soil and bedrock. Any number of surface activities, including agricultural and suburban-urban stormwater and wastewater disposal, mining, storm water runoff, lawn care, improper well construction or closure, and individual onsite wastewater disposal practices, pose threats to surface water and groundwater quality. However, overall water quality remains good as a result of efforts to protect vulnerable aquifers in the Ozarks.

Groundwater is relied upon heavily for drinking water supply in this part of Missouri. Most municipalities in the southern half of the state use only groundwater for drinking water supply. The number of private drinking water wells statewide is not known, but is probably between 100,000 and 250,000, mostly south of the Missouri River. One major groundwater concern is the often rapid and unfiltered transmission of contaminated surface runoff or leachate (e.g., septic tanks, underground storage tanks, landfills, animal production or processing waste, etc.) wastes through fractures or sinkholes directly into potable aquifers. Properly cased wells into deep

aquifers rarely encounter water quality problems, but shallow or improperly cased wells are at risk.

Mississippi Alluvial Basin

The Mississippi Alluvial Basin consists of flat terrain that at one time was largely covered by seasonal or perennial wetlands called "swamp forests." Nearly all of the historic land cover in this region has been converted to crop production, many streams have been channelized, and the land is drained by hundreds of man-made ditches. The natural hydrography of perennial and seasonal wetlands has been modified here more than anywhere else in Missouri and aquatic habitat degradation is widespread.

Groundwater is abundant due to high infiltration rates on these flat fields. Public water supplies that tap deeper aquifers provide good quality water, but shallow private wells may have nitrates and low levels of pesticides at times. The exceedence frequency of drinking water standards for nitrates and pesticides in private wells would be roughly similar to that in northern Missouri.

Great Rivers

The Great Rivers, Missouri and Mississippi rivers, are not classified as a subregion on their own, but are certainly unique aquatic ecosystems and a significant resource of Missouri. Approximately 1,053 miles of Great River habitat fall under Missouri's jurisdiction. Great Rivers support a wide array of industrial and commercial needs, numerous recreational opportunities, and are utilized as primary sources of drinking water for many communities. Fish fauna of Great Rivers is comprised of a distinct assemblage of species, some of which occur nowhere else in Missouri (Pflieger 1997).

In northern Missouri, where surface and deep aquifer supplies are unreliable, many towns depend on the alluvial aquifer of nearby rivers. Landfills and industrial land use in Kansas City and St. Louis have historically been located on river floodplains and have caused local contamination of the Mississippi, Missouri, and Meramec river aquifers near St. Louis and the Missouri River aquifer in Kansas City. While alluvial aquifers of Great Rivers may yield large quantities of groundwater, pumping induces recharge from the rivers which is a potential source of contamination. Some municipal water supplies have been impacted by groundwater contamination in the past, thus groundwater from these aquifers require treatment.

B.3. Water Pollution Control Program

Missouri Surface Water Quality Standards

Authority for enforcing Missouri Clean Water Law and state regulations concerning water pollution resides with the Department's WPP. Missouri's approach to water quality management is primarily based on its water quality standards provided in 10 CSR 20-7.031. Under this rule, waters of the state are protected for specific designated uses. Water quality standards are the basis for protecting designated uses, which in Missouri include: (1) drinking water supply; (2) human health protection - fish consumption; (3) whole body contact recreation (e.g., swimming); (4) secondary contact recreation (e.g., fishing and wading); (5,6) aquatic life protection for general warm water and limited warm water fisheries; (7,8) cold water and cool water fisheries; (9) irrigation; (10) livestock and wildlife watering; (11) industrial process and cooling water; (12) storm and flood water storage; (13) habitat for resident and migratory wildlife species including rare and endangered species; (14) recreational, cultural, educational, scientific, and natural aesthetic values and uses; and, (15) hydrologic cycle maintenance. For data management purposes, the Department combines the aquatic life designated use with the human health protection - fish consumption designated use; however, each use is protected by its own set of criteria and assessed separately. The Department is responsible for developing scientifically

based water quality standards and proposing them to the Missouri CWC for adoption into state regulations. In accordance with the federal CWA, Missouri is required to review and update water quality standards every three years.

To determine if designated uses are being protected, two general modes of water quality standards are used, narrative and numeric criteria. Narrative criteria are essentially protective descriptions that may be measured using numeric values. For example, 10 CSR 20-7.031(3)(D) states that waters shall be free from substances or conditions in sufficient amounts to result in toxicity to human, animal, or aquatic life. Quantitative methodologies then utilize numeric values to determine if a narrative criterion is exceeded and if such substance(s) is having a toxic effect on human, animal, or aquatic life. In some cases, narrative criteria alone may be used to assess attainment of designated uses. For example, under 10 CSR 20-7.031(3)(A), waters shall be from substances in sufficient amounts to cause the formation of putrescent, unsightly, or harmful bottom deposits to prevent full maintenance of designated uses. Streams with dense mats of floating sewage scum are in violation of this narrative standard. Numeric criteria are essentially numeric standards used to determine if designated uses are attained or not. Quantitative methods always use measured numeric values to examine if the numeric criterion is being upheld.

Additional protection to state waters is provided in the antidegradation component of water quality standards as contained in 10 CSR 20-7.031(2). Missouri's antidegradation policy consists of a three tiered system. In the first tier, public health, in-stream uses, and a level of water quality necessary to protect in-stream uses shall be maintained and protected. Second, in cases where water quality is better than applicable water quality criteria, the existing quality shall be protected and maintained. Lowering of in-stream water quality is only allowed in such cases when it is determined to be a necessity for important economic and social development. This second tier also contains a set of strict provisions that must be followed for any permitted degradation of state waters. Third, there shall be no degradation of water quality in outstanding national resource waters or outstanding state resource waters as listed in Tables D and E of 10 CSR 20-7.031.

Point Source Pollution Control

The Department, under the State of Missouri's authorization, administers a program equivalent to the National Pollution Discharge Elimination System (NPDES). Under Missouri Clean Water Law, the Missouri CWC issues permits for discrete wastewater discharges (e.g., human wastewater, industrial wastewater, stormwater, confined animal operations, etc.) that flow directly into surface waters. Industrial, municipal, and other facilities are regulated in order to ensure surface waters receiving such effluent meet water quality standards. Permits include requirements for limitations on specific pollutants (e.g., biological oxygen demand, ammonia as nitrogen, chlorine, etc.), monitoring and reporting, and the implementation of best management practices (BMPs) as needed. The Department requires wastewater facilities to meet certain design specifications, while plant supervisors and other operators are required to be certified at a level that corresponds to the plant's size and complexity. Approximately 135.7 miles of classified waters are on the 2014 303(d) List as a result of illicit discharges from wastewater treatment facilities. For additional information on the types of regulated discharges and available permits, please see the Department's website at http://www.dnr.mo.gov/env/wpp/permits/index.html.

Confined animal feeding operations (CAFOs) in Missouri are required to be designed, constructed, operated and maintained as "no discharge" facilities. All wastewater produced is land applied rather than being treated and released to streams. Permit requirements include development and implementation of a nutrient management plan which contains a strategy for onsite utilization of BMPs. There are approximately 526 permitted CAFOs in Missouri, and over

96 percent are managed for hog and poultry production. For more information on CAFOs, please see the Department's website at http://www.dnr.mo.gov/env/wpp/cafo/.

The Department issues land disturbance permits to control stormwater runoff from disturbed sites that comprise an area of one acre or more. Land disturbance permits require the use of BMPs to prevent the migration of silt and sediment into surface waters. A stormwater pollution prevention plan must also be prepared prior to issuance of any permit. Some activities that commonly require land disturbance permits include housing or building construction, road and dam construction, and utility pipelines. For more information on land disturbance permits, please see the Department's website at http://www.dnr.mo.gov/env/wpp/stormwater/sw-land-disturb-permits.htm.

The discharge of stormwater runoff transported through Municipal Separate Storm Sewer Systems (MS4s) is another regulated activity. Separate storm sewer systems include any method of conveying stormwater including streets, ditches, swales, or any manmade structure that directs flow. There are 164 identified MS4s in Missouri, and each one is required to develop and implement a stormwater management program to prevent and reduce any contamination of surface waters and prevent illegal discharges. The stormwater management plan includes six minimum control measures: (1) public education and outreach; (2) a process for public involvement and participation; (3) illicit discharge detection and elimination; (4) construction site stormwater runoff control; (5) post construction stormwater management; and, (6) pollution prevention/good housekeeping for municipal operations. For additional information regarding stormwater regulations, please see the Department's website at http://www.dnr.mo.gov/env/wpp/stormwater/index.html.

Effluent regulations may vary by water body as described in 10 CSR 20-7.010(1)(A). Special discharge requirements have been afforded to two of Missouri's reservoirs, Table Rock Lake and Lake Taneycomo. Specifically, the concentration of phosphorus in wastewater effluent entering these waters and their tributaries is limited to 0.5 mg/L or less as a monthly average. This requirement is intended to protect the high aesthetic and recreational qualities of this lake, and generally applies to facilities discharging more than 22,500 gallons per day. These limits may be affected as numeric nutrient criteria for lakes are established by rule.

Nonpoint Source Pollution Control

Nonpoint source (NPS) pollution comes from many diffuse sources and is defined as the transport of natural and man-made pollutants by rainfall or snowmelt, moving over and through the land surface and entering lakes, rivers, streams, wetlands or groundwater. Some common sources of NPS pollution include row crops and agricultural fields, road surfaces and parking lots, septic systems and underground storage tanks. In Missouri, significant contributors of NPS pollution include agricultural land use, urban areas, and abandoned mines. The Department takes two general approaches to managing NPS pollution, one that is volunteer based and offers monetary incentives and grants, and another that is regulatory focused.

Many NPSs may be addressed by the Department's Nonpoint Source Management Program. This program engages concerned citizen organizations, landowners, federal, state and local governments, as well as universities and other stakeholders to implement NPS control practices and monitor improvements to water quality and habitat. One priority of the Nonpoint Source Management Program is to provide citizens the knowledge and ability to improve their common land use practices and to protect water quality. The program's mission is "*to achieve aquatic life usage in 50 percent of nonpoint source impaired waters by 2030.*" NPS projects target numerous runoff pollutants (e.g., sediment, fertilizers, pesticides, and animal waste) and seek to improve

aquatic habitat problems by stabilizing stream banks, installing grade control structures, and providing riparian and in-stream cover to name a few. With the exception of special projects, funded activities are carried out as part of a larger watershed plan to improve specific stream and lake resources. Project funding is provided by the USEPA though Section 319(h) of the federal Clean Water Act, and supports 60 percent of total project costs. The Nonpoint Source Program is a key partner of the Natural Resources Conservation Service's (NRCS) Mississippi River Basin Initiative (MRBI) and the recent NRCS-USEPA collaborative National Water Quality Initiative. For more information regarding the Department's Nonpoint Source Management Program, please visit the program's website at http://www.dnr.mo.gov/env/wpp/nps/index.html.

The Department's Soil and Water Conservation Program (SWCP) provides financial incentives to landowners for implementing conservation practices that help prevent soil erosion and protect water resources. Under this program, 114 district offices serve residents in each county of the state. The SWCP's Agricultural Nonpoint Source Special Area Land Treatment Program allows district staff to direct technical and financial assistance to property owners of agricultural lands identified as contributing sources of water quality impairments. SWCP also administers a cost-share program to help fund up to 75 percent of the estimated cost for certified conservation practices. In addition, SWCP is a contributing partner of the Mississippi River Basin Healthy Watersheds Initiative (MRBI), a 12-state effort addressing nutrient loading in the Mississippi River Basin. Under the MRBI, SWCP district staff obtained $34.4 million in funding from NRCS to help support 12 projects to be completed between 2010 and 2014. SWCP's primary funding source comes from a one-tenth-of-one-percent parks, soils, and water sales tax that is shared with the Division of State Parks. Please visit the SWCP website for more information at http://www.dnr.mo.gov/env/swcp/index.html.

While general NPS pollution is not formally regulated, there are instances of several different types of NPSs falling under a form of water pollution control. As noted earlier, permits are issued to control stormwater runoff from land disturbance activities of an acre or more, as well as for certain industries like biodiesel manufacturers and agrichemical producers. Some additional activities permitted by the state include clay, rock, and mineral mining, abandoned mine land reclamation, land application of human and animal wastewater, and underground petroleum storage. Construction, placement, dredging and filling, or general earth moving within a wetland or waterbody requires a 401 certification from the Department and 404 permit from the United States Army Corps of Engineers (USACE) (http://www.dnr.mo.gov/env/wpp/401/). Single family residential wastewater systems, septic systems, which are known nonpoint sources of pollution fall under the jurisdiction and responsibility of the Missouri Department of Health and Senior Services.

Total Maximum Daily Load Program

The Total Maximum Daily Load (TMDL) program provides the framework for identifying and cleaning up streams and lakes that are impaired. A TMDL is defined as a calculation of the maximum amount of pollutant that a water body can assimilate and still safely meet water quality standards. TMDLs are required when a water body and pollutant pair(s) is listed on the state's approved 303(d) list, or in other words, when the designated use of a water is not being protected. The TMDL calculation is established for a known or suspected pollutant(s) in a watershed, and the final TMDL is based on loading from various sources. One portion of the TMDL is allocated for point sources and the other for nonpoint source contributions; a margin of safety is built into the final calculation to account for uncertainties in scientific and technical understandings of water quality in natural systems. The department is in the process of developing implementation plans to accompany TMDLs in order to identify how pollutant loads can be reduced to a level that protects water quality.

Since 1999, the Department and USEPA, have developed 122 TMDL documents and permits in lieu of TMDLs. In some cases, TMDL documents contain multiple TMDLs to address each water body and pollutant pair. There are 33 TMDLs that are under various stages of development for Federal Fiscal Year (FFY) 2013, and that list along with all other TMDLs scheduled to be completed through FFY 2026 is provided in Appendix C. Additional information regarding the TMDL program can be found at http://www.dnr.mo.gov/env/wpp/tmdl/.

Watershed Based Programs

In the fall of 2011, the Department announced a new approach for managing waters of the state. Appropriately named Our Missouri Waters Initiative (OMWI), this program focuses on developing local participation at the watershed level in order to address unique challenges facing streams and lakes in Missouri. The program looks to bring together key stakeholders in each watershed, state and federal agencies, and harness as much technical and financial support as necessary to improve each watershed. The Department selected three pilot watersheds to concentrate on for the initiative's first phase, the Spring River, Big River, and Lower Grand River watersheds. As of October 2013, each watershed has held a summit for discussing prevailing issues and best strategies for protecting surface and groundwater resources. Additional information regarding OMWI may be found at http://dnr.mo.gov/OMWWatersheds.htm.

In 2012, the Department adopted a watershed based management framework for managing the state's water resources and integrating activities under OMWI (MDNR 2012). Managing waters using a watershed approach requires the Department to synchronize activities occurring in a watershed, including: monitoring, assessment, planning, permitting, modeling, conservation and BMPs, and other department activities. The watershed based framework overall is a strategy for streamlining and coordinating watershed activities and ideally, addressing aquatic resource issues more effectively.

Within the watershed based management framework, 66 8-digit Hydrologic Unit Codes (HUCs) in the state are divided into five groups with each group having a specific five-year planning cycle. On average, there are 13 HUCs per group, each with an average of 275 site specific permits (discharge >50,000 gpd) that will be synchronized for renewal every five years. The planning cycle coincides with CWA Section 402 NPDES permitting requirements and better equips the WPP, and other programs and agencies, to plan and coordinate any activities taking place within each subbasin. Permit synchronization first began in 2012, but due to permit density across management jurisdictions, synchronization for some permits may not be completed until 2022.

B.4. Cost/Benefit Assessment

Section 305(b) requires the state to report an estimate of economic and social costs and benefits required to realize objectives of the CWA. Cost information pertaining to water quality improvement and protection efforts is difficult to calculate exactly, but can be estimated to some degree. While the Department tracks its own programmatic costs, encumbrances due to municipal, private, and industrial treatment facility operations, and in some cases, the implementation of BMPs, are typically not readily available. Economic benefits, in monetary terms, resulting from water protection efforts are even more difficult to obtain. An overview of the amount of funding the Department spends on various aspects of water pollution control and prevention is provided in the following paragraphs.

The Department spends an average of $2.9 million on monitoring and analysis of ambient water and related media each year. Annual costs for permit issuance total approximately $2.6 million

on average. On average, approximately $7.6 million is spent each year for other facets of water pollution control and administrative support.

Another significant expense includes grants aimed at improving water quality. The Department awards funding provided by the USEPA under Section 319 of the CWA for projects that address NPSs of pollution, and approximately $2.1 and $2.8 million was spent on NPS projects in state fiscal years (SFYs) 2012 and 2013, respectively. Approximately, $200,000 is awarded annually for planning such projects.

Through the Department's SWCP, an average of $30.4 million each year is distributed directly to landowners to address agricultural NPS pollution and to conserve and protect the quality of water resources in agricultural landscapes. Over FFYs 2011 to 2013, a total of $91.2 million was spent on SWCP conservation practices aimed at reducing soil runoff from farmland. Conservation practices have focused on managing animal waste, livestock grazing, irrigation, nutrients and pests, protecting sensitive areas and reducing erosion. Over the life of these conservation practices (i.e. generally 10 years), it's estimated that 6.9 million tons of soil will be protected.

Missouri's Clean Water State Revolving Fund (SRF) leveraged and low interest loans are offered to eligible applicants for designing, planning, and constructing public wastewater systems. More recently, other projects have become eligible for SRF loans including those that address urban runoff, stormwater and sewer overflows, alternative treatment technologies, and even water reuse systems. In SFY 2011, no leveraged loans were issued but the state made ten direct loan commitments totaling $130,897,214, which included two direct loans through the animal waste treatment loan program (MDNR 2012b). In SFY 2012, seven direct loan commitments totaling $89,433,300 and one SRF grant for $1,000,000 (MDNR 2012c) were made. Funding is provided by the USEPA with a matching amount from the state of Missouri. Since 1989, the SRF's cumulative binding commitments have totaled $2,248,529,652, and as of June 30, 2012, the SRF program has saved communities $737,175,771 in interest compared to conventional loans.

The Department's Public Drinking Water Branch operates a Source Water Protection Program (SWPP) that is designed to keep drinking water safe for Missouri's residents. The SWPP operates under a voluntary basis to provide public water suppliers with opportunities to protect drinking water that may be threatened by potential contaminants such as pesticides, other hazardous chemicals, stormwater runoff, and waste disposal sites and septic tanks. Funding activities primarily include wellhead protection and capacity development. Costs associated with implementing SWPP activities are generally funded by drinking water SRF set aside monies.

Looking ahead, the Natural Resource Damages program (NRD), based primarily upon authority vested in the federal "Superfund" law is responsible for assessing injuries to and restoring natural resources that have been impacted by environmental hazards. The NRD, together with federal trustees such as the United States Fish and Wildlife Service (USFWS) and United States Forest Service (USFS), have achieved several settlements totaling slightly more than $61.64 million to restore impacted natural resources and their services. Natural resource damage assessment and restoration settlements were largely the result of impacts from heavy metal mining. Two regional restoration plans have been developed to date, including one for the Southeast Missouri Ozarks Lead Mining District (SEMOLMD) and another for the Springfield Plateau. As funding becomes available, some of it will be used to clean up or mitigate heavy metal contamination in the streams and lakes of these regions.

To maximize efficiency, the Department routinely coordinates its monitoring activities to avoid overlap with other agencies and to provide and receive interagency input on monitoring study

design. Program coordination between Missouri and Arkansas is one specific example. Both states entered into a Memorandum of Agreement on November 2008 with the goal of enhancing and promoting cooperation among resource management agencies to address water quality and quantity issues involving surface and ground water resources shared between the two states.

Water quality is an essential prerequisite for quality living in Missouri. The economic benefits of clean water, while difficult to quantify, include: countless opportunities for water-based recreation such as canoeing, swimming and quality sport fishing; the ability to safely incorporate fish into one's diet; restored stream environments; aquatic ecosystems teeming with abundant and diverse animal and plant life; and access to quality drinking water with reduced financial burden on those that treat water. The Department's water protection efforts yield economic benefits far-reaching in scope, helping to insure a prosperous outlook for future generations of Missourians.

B.5. Special State Concerns and Recommendations
Missouri has accomplished great advances in environmental quality due to its water protection programs. Municipal and industrial wastewater discharged to state waters is not permitted without forethought given to the potential impacts to receiving waters. Improved forestry and agriculture practices have reduced polluted runoff. The same conservation practices have helped preserve farmland and enhance wildlife habitat. Missouri waters are certainly cleaner today than 30 or 40 years ago, but despite all of the advancements in water quality, significant threats still remain. Current major environmental concerns may be divided into several different categories.

Agricultural and Urban Land Use as Nonpoint Sources of Pollution
Managing agricultural and urban runoff is an ongoing challenge in Missouri as each land use wields a great deal of influence on the condition of water quality. Cropland runoff may be loaded with sediment, nutrients, and pesticides. Pollutant loads from urban runoff include sediment from new development and construction; oil, grease, and other chemicals from automobiles; nutrients and pesticides from commercial and residential lawn management; grass clippings and brush disposal into streams; road salts, and even heavy metals. Impervious surfaces such as roadways and roof tops increase water volumes in streams during events and lower baseflows during dry periods; the result is eroded stream banks, widened channels, and impaired habitat. Moreover, impervious surfaces are easily heated by the sun which in turn warms surface runoff and ultimately causes stream temperatures to increase. Changes in water quality and habitat conditions that generally accompany urban and agricultural runoff impair aquatic life and diminish the value of other designated uses.

Department programs that are both regulatory and voluntary based have proven effective for managing runoff, but such programs are not available to cover all runoff problems occurring across the state. Additional resources and external support is needed to eliminate the threat of NPS runoff.

Municipal and Industrial Sources
Wastewater treatment facilities and other point source dischargers have a significant impact on water quality. Point sources are subject to NPDES permit requirements; however, pollution occurrences still happen from time to time. Failing treatment systems, bypasses, accidental spills, or illicit waste disposal are some types of violations that can occur. Adverse effects may be the result of individual sources or even the cumulative effects of multiple sources on a single water body. Discharges of inorganic nutrients may promote blooms of algal growth in receiving waters. Raw or partially treated sludge releases wreak havoc on aquatic communities as organic matter is decomposed and dissolved oxygen removed from the water. Other toxic substances can have more direct effects on aquatic life as well.

Pharmaceutical and Personal Care Products (PPCPs) include any product used by individuals for personal health or cosmetic reasons, or those used by agribusiness to enhance the growth or health of livestock. Some example PPCPs include endocrine disrupting sex hormones, antibiotics, steroids, antidepressants, and various prescription and over-the-counter drugs. Treatment facilities are not equipped to eliminate PPCPs as these substances pass through wastewater treatment systems on their way to streams and lakes. While little is known about the impacts of PPCPs on human health, all aquatic organism at any stage in development may be affected. One direct effect of PPCPs is the feminization of male fish as a result of estrogens being released into the water.

The Department has worked with numerous entities to upgrade wastewater treatment facilities in order to meet water quality standards. While the majority of treatment facilities are in compliance, additional facility upgrades will alleviate water quality problems further, allowing other threats that are more NPS based to be addressed.

Abandoned Mines

Current mining operations have caused significant changes to water quality. Heavy metals such as lead and zinc may enter streams from smelters, mills, mine water, and tailings ponds. However, abandoned lead-zinc mines and their tailings continue to impact waters as well, even after mining has ceased for decades. Mines that have been left exposed to the elements may pollute waters via stormwater, erosion, and fugitive dust. Through these same pathways, mines that were properly shutdown after operations, but then reclaimed for another land use, have also polluted the environment.

Missouri's Superfund Program is addressing some of these concerns, but despite such efforts, long-term impacts are expected to remain until additional resources are made available. Monitoring will need to target abandoned mines that are suspected of contributing heavy metals to streams. Similarly, reclaimed mines may need to be inspected from time to time to ensure post closure actions have been maintained. Although new mineral extraction operations would be managed under state permits, areas of the state that are sensitive to disruption are being investigated for mining potential.

Concentrated Animal Feeding Operations (CAFOs)

As of March 2013, there were 458 Class I CAFOs located in Missouri. These include operations containing at least 1,000 beef cattle, 2,500 large swine, or 125,000 broiler chickens. Facilities that generate large amounts of animal waste and manure have the potential to cause serious water pollution problems. Commercial application of manure on fields is also a growing trend within large-scale agriculture operations. The Department is concerned by the cumulative impacts of numerous small animal production facilities as well. However, it is no longer issuing letters of approval for smaller facilities, meaning they will be largely unregulated.

Missouri's CAFO laws and regulations are designed to minimize any threats of water pollution and ensure long-term protection for the environment. A series of permits are required per CAFO, including an operating permit, construction permit and land disturbance permit. Additionally, issued permits require a nutrient management plan and the implementation of certain management practices for the land application of animal waste.

Mercury in Fish Tissue

Mercury levels in fish continue to impair fish consumption in Missouri waters. In 2014, 42 water bodies covering 696 stream miles and 25,309 lake acres were listed as impaired for mercury in

fish tissue. Waters that have been monitored for long periods have shown that mercury levels in fish tissue have remained relatively stable over the years. Without adequate air pollution control, it's expected that future monitoring will lead to identifying new waters with elevated levels of mercury in fish tissue.

The Missouri Department of Health and Senior Services (MDHSS) issues an annual health advisory and guide for safely eating fish. Due to mercury, the MDHSS has issued a statewide advisory for a sensitive population that includes children younger than13, pregnant women, women of childbearing age and nursing mothers. This group is advised to limit consumption of walleye, largemouth bass, spotted bass and smallmouth bass greater than 12 inches in length to one meal per month, and all other sport fish to one meal per week. This advisory also includes a limit of one meal per month for white bass greater than 15 inches in Clearwater Lake only. Additional advisories for all consumers due to other contaminants may be found at http://health.mo.gov/living/environment/fishadvisory/. In most instances and for most people, the health benefits of eating fish outweigh the potential risks from contaminants. The Department plans to continue monitoring for mercury levels in fish.

Eutrophication

Eutrophication of state waters, particularly large reservoirs that are recreationally important, is an ongoing concern. Heavy residential development around portions of these reservoirs can threaten water quality in many small coves and shoreline areas. The large size of these reservoirs and rugged local topography make centralized collection and treatment systems for wastewater difficult. Without proper maintenance of lakeside septic systems, latent nutrient enriched water can find its way to the lake.

Missouri's water quality standards do not include statewide nutrient criteria, but site-specific criteria have been assigned to a limited set of lakes. Moreover, the imposition of phosphorus limits on most wastewater discharges to Table Rock Lake has reduced phosphorus conditions in the James River arm. The Department continues to track lake nutrient conditions and offers various programs and grants to help address any issues and concerns. Recently, the Department awarded $1,000,000 to the Upper White River Basin Foundation for the purpose of assisting homeowners with the cost of replacing failing septic systems through a combination of grants and loans through the WPP's Financial Assistance Center.

Groundwater Protection

Additional groundwater protection measures are needed. Missouri has in place programs that register and inspect underground storage tanks and oversee the cleanup of leaking underground storage tank sites. Additional programs address wellhead protection, sealing of abandoned wells, and closing of hazardous waste sites. A complete groundwater protection program would also include a groundwater monitoring network accompanied by educational programs for those involved in the application of farm chemicals, transport of hazardous materials, and the general public. Additional information may be found at http://www.dnr.mo.gov/env/hwp/tanks/tanks.htm.

Additional Concerns

Beyond the threats and concerns mentioned above, there are others that remain. Fish and macroinvertebrate data from across the state indicate biological communities are suffering from degraded aquatic habitat. Physical alterations of the channel, alterations in stream flow patterns, degraded conditions in the riparian zone, and upland land use changes in the watershed are all believed to be significant contributors to this problem. Stream channelization is prevalent in the northern and western Central Plains as well as the Mississippi Alluvial Basin in the southeastern

corner of the state. Large scale channelization projects no longer occur, but smaller projects are still carried out to facilitate urban and residential development. Stream road crossings are problematic to aquatic life as well. Often, low water crossings and improperly placed and sized culverts, which are ubiquitous across Missouri, create upstream barriers to fish passage and are primary points of habitat fragmentation. It's common for multiple obstructions to occur on a single stream.

Aquatic nuisance species pose a significant threat to the aquatic resources and economy of Missouri. Several invasive species are already present in some waters of Missouri including the zebra mussel (*Dreissena polymorph*), Eurasian water milfoil (*Myriophyllum spicatum*), and silver carp (*Hypothalmichthys molitrix*). Rock snot (*Didymosphenia geminate*) and hydrilla (*Hydrilla verticillata*) have been found in neighboring states and are constant threats due to human dispersal. MDC developed an Aquatic Nuisance Species Management Plan in February 2007.

Climate change presents additional challenges to the state's aquatic resources. In the Midwest coldwater fish species are projected to be replaced by cool water species (Karl *et al.* 2009). While precipitation is projected to increase in winter and spring with intense events occurring more frequently throughout the year, warmer temperatures during summer will increase the likelihood of drought (Karl *et al.* 2009). The subsequent changes in stream flow are more likely to have a negative impact on aquatic habitats and residing organisms. According to Missouri's Forest Resource Assessment and Strategy (Raeker *et al.* 2010), riparian forests could become more important than ever for protecting stream banks and providing filtering functions under a significantly wetter climate. Previously mentioned aquatic invasive species are projected to benefit under a changing climate as they tend to thrive under a wide range of environmental conditions compared to a narrower range tolerated by native species (Karl *et al.* 2009).

PART C: SURFACE WATER MONITORING AND ASSESSMENT

C.1. Monitoring Program

The overall goal of Missouri's water quality monitoring program is to provide sufficient data to allow for a water quality assessment of all waters of the state. This goal is achieved by meeting six specific objectives: (1) characterizing background or reference water quality conditions; (2) better understanding daily, flow event and seasonal water quality variations and their underlying processes; (3) characterizing aquatic biological communities and habitats and distinguishing differences between the impacts of water chemistry and habitat quality; (4) assessing time trends in water quality; (5) characterizing local and regional impacts of point and NPS pollution on water quality, which includes compliance monitoring and development of water quality based permits and TMDL studies; and, (6) supporting development of strategies to return impaired waters to compliance with water quality standards.

Monitoring includes four strategic approaches to meet each of the six specific objectives mentioned above: (1) fixed station monitoring; (2) intensive and special surveys; (3) screening level monitoring; and, (4) probability-based surveys. Missouri's "Surface Water Monitoring Strategy" (MDNR 2013) provides an in depth discussion of the entire water quality monitoring program and strategy. All monitoring is conducted under an approved Quality Assurance Project Plan with the Department's Environmental Services Program (ESP) laboratory. The Department's quality assurance management program was previously approved by USEPA.

Fixed Station Monitoring

The fixed station monitoring network is designed to obtain water chemistry, sediment, fish tissue, and biological monitoring sites equitably among major physiographic and land use divisions in the state. Selected sites must meet one of the following two criteria: (1) the site is believed to have water quality representative of many neighboring streams of similar size due to similarity in watershed geology, hydrology and land use, and the absence of any impact from a local point or discrete nonpoint water pollution source, or (2) the site is downstream of a significant point source or localized nonpoint source area. There are five subprogram areas that make up the fixed station network.

1. The Department provides funding for an ambient stream network that includes nearly 70 sites monitored between six to 12 times per year by the USGS for a wide variety of physical, chemical and bacteriological constituents, and six of these sites are also sampled at less frequent intervals for a range of pesticides. Two sites on the Missouri River use sondes to collect continuous water quality data from spring through fall.

2. DNR chemical monitoring at approximately 58 sites two to 24 times per year for nutrients, major ions, flow, temperature, pH, dissolved oxygen and specific conductance.

3. Lake monitoring consists of two programs, the Statewide Lake Assessment (SLAP) and the Lakes of Missouri Volunteer Program (LMVP). SLAP samples 75 lakes four times each summer (nearly 90 lakes were sampled in 2013) for nutrients, chlorophyll, volatile and nonvolatile solids, and secchi disc depth. LMVP samples approximately 66 lakes four to six times each year, which includes multiple sample sites on larger reservoirs for nutrients, chlorophyll, and secchi disc depth. For additional information regarding LMVP, please see this program's website at http://www.lmvp.org/ .

4. Fish tissue monitoring is conducted to assess the health of aquatic biota as well as the human health risk associated with consuming fish. Fourteen fixed sites are monitored once every two years and samples analyzed by USEPA for mercury, chlordane, and Polychlorinated Biphenyls (PCBs). Whole fish composite samples of either common carp or redhorse sucker are analyzed for metals, mercury, cadmium, selenium, several pesticides, and PCBs. In the future, USEPA plans to analyze such samples for only mercury; therefore, the Department is currently seeking another means to maintain PCB analyses.

   Under a joint effort between the Department and MDC, samples of bottom feeding and non-bottom feeding fish at approximately 28 discretionary sites are sampled annually. Bottom feeding fish include common carp and sucker species. Non-bottom feeding fish include black bass preferably, and alternatively, walleye, sauger, northern pike, trout, flathead catfish, and blue catfish. Tissue plug samples are collected from bass species and analyzed for mercury only. Fillet samples (skin off) are collected from the remainder of bottom and non-bottom feeding species. Fillet samples are analyzed for metals, including mercury, cadmium, and selenium; additionally, fillet samples from bottom feeding species are analyzed for a suite of organic compounds, including several pesticides and PCBs.

   Outside of Department based sampling, MDC monitors another 20-40 sites each year that are considered popular sport fisheries. Fish tissue is analyzed for pesticides, PCBs, mercury and other metals. This data is submitted to the Department and is used to assess aquatic life use.

5. Routine sediment monitoring is conducted at 10-15 discretionary sites annually to test for sediment contamination. Sediment samples are analyzed for a suite of heavy metals that individually or synergistically are known to be lethal to fish, mussels, and other macroinvertebrates.

In addition to sampling activities noted above, the Department's Division of State Parks conducts routine bacterial monitoring of swimming beaches during the recreational season.

Intensive and Special Studies
Intensive and special studies typically involve frequent monitoring of several sites in a small geographic area. These studies are driven by the need for site specific water quality information. Findings resulting from intensive and special studies may be used to develop water quality based NPDES permit limits, assist with compliance and enforcement activities, or guide resource management. The Department currently conducts several types of intensive and special studies.

- Wasteload Allocation Studies – Assess receiving waters of wastewater treatment facilities to judge compliance with in-stream water quality standards and/or be used to develop water quality based permit limits. Approximately ten wasteload allocation studies are completed annually.

- Toxics Monitoring – Assess receiving waters of coal mining and processing stations, metal mining operations, various industrial and municipal facilities and CAFOs. The need for this type of monitoring varies greatly from year to year, but typically includes zero to 30 sites. Sampling frequency depends on the intended use of data.

- Aquatic Invertebrate Biomonitoring – Macroinvertebrate communities are surveyed to evaluate concerns with either point source discharges, discrete NPS areas such as active or abandoned mining sites, or watershed wide NPS problems. Reference sites are sampled periodically as controls which targeted sites may be compared to. Approximately 45-50 sites are sampled each year.

  The Department contracted with the USGS in 2001 to conduct a study of aquatic invertebrate communities on the Missouri River. The study, *Validation of Aquatic Macroinvertebrate Community Endpoints for Assessment of Biological Condition in the Lower Missouri River*, was published in 2005. The Department sees this work as the first of several steps by which it will promote a better understanding of fish and invertebrate communities of large rivers, and ultimately the development of biological criteria for the Missouri and Mississippi rivers.

- Dissolved Oxygen Studies – Continuous monitors are deployed where low dissolved oxygen levels are suspected. Sampling is carried out below select hydropower dams with past low dissolved oxygen problems and in other areas where noncompliant discharges are suspected.

- Stream Modeling Studies – Physical and chemical characteristics of designated streams are surveyed. Measurements include the following parameters: channel width and depth, water velocity, water temperature, pH, dissolved oxygen, and chemical biological oxygen demand, and ammonia. Such studies are often carried out for wasteload allocation purposes. Sampling occurs as needed, but is usually limited to about two streams each year.

- Contract Studies – The Department typically has several active contracts for water quality monitoring at any given time. Most contracts support CWA Section 319 funded watershed projects, but past contractors have completed Use Attainability Analyses (UAAs) as well as simple monitoring projects, specifically in cases where work entailed highly specialized skills and equipment, or when costs or manpower limitations made it practical.

Screening Level Monitoring

Screening level monitoring involves two separate strategies, low flow surveys and volunteer based water quality monitoring. Both strategies integrate rapid stream assessment protocols that rely on qualitative sampling of stream biota and visual evidence. Additional water chemistry sampling may occur as a result of inspections and complaint investigations.

Low flow surveys are conducted to assess stream condition potentially influenced by wastewater treatment facilities, mining activities, or landfills. These surveys are a rapid and inexpensive method of screening large numbers of streams for obvious water quality problems and determining where more intensive monitoring is needed. Generally, around 100 sites are screened each year.

The Volunteer Water Quality Monitoring (VWQM) Program is a cooperative project between the Department, MDC, and the Conservation Federation of Missouri. This program is a subset of the Missouri Stream Team Program. Since its inception in 1993, 8,907 citizens have attended 520 water quality monitoring workshops held by program staff across the state. This has resulted in the submission of more than 23,601 separate data sheets at 5,574 Missouri stream sites. Volunteer hours spent in this endeavor total more than 435,597 hours, worth an approximate $8,276,352 in added value to the state.

In SFY 2012, 115 new stream teams formed and in 2013 there were 186. The total number of stream teams has now reached 4,842. In 2012, a total of 240 citizens attended the introductory class, while 230 attended the same workshop in 2013. After the Introductory workshop, many proceed on to at least one workshop for higher level training. In SFY 2012, 64 citizens attended the Level 1 workshop, and in SFY 2013 there were another 68 citizens. The number of volunteers that attended Level 2 workshops in SFY 2012 and 2013 were 38 and 18, respectively. In 2012, Level 3 and Cooperative Stream Investigation (CSI) certifications were suspended due to the poor health and untimely passing of the staff member in charge of this part of the program. However, a replacement was hired and in 2013, five volunteers achieved the Level 3 designation. Each level of training is a prerequisite for the next higher level, as is appropriate data submission. Levels 2, 3, 4, and CSI represent increasingly higher quality assurance and quality control stringency. Data submitted by volunteers of Level 2 or above may be used by the Department to establish baselines of water quality condition for particular streams, or to point out potential problems that are in need of further investigation. Level 2 and higher volunteer monitors are required to return for a validation workshop at least every three years in order to ensure their equipment and methods are up to date, and the data they are gathering has a high level of quality assurance. In total, 30 volunteers have received CSI training as of July 2013. In SFYs 2012 and 2013, volunteers submitted 4,023 sets of macroinvertebrate data, 2,854 sets of water chemistry data, 1,094 sets of visual survey data, 1,418 sets of stream discharge data, and 125 site selection data sheets. Wastewater, CAFO and drinking water operators have also attended workshops in order to receive operator certification credits. To date, 210 operators have attended stream team trainings.

Level 2 volunteer data, or higher, is screened annually for physical, chemical, and biological parameters. If adequate data is indicating a water quality concern or a potential issue, then follow

up monitoring by the Department is scheduled. CSI level volunteers may be directly utilized for assisting in departmental studies (e.g., watershed planning, TMDL implementation plans, etc.). For additional information regarding the Department's VWQM program, please visit the following website http://www.dnr.mo.gov/env/wpp/VWQM.htm.

Probability-based Sampling

The Department's probability-based sampling is derived from a partnership with the MDC that is formalized in a signed Memorandum of Understanding (MOU). With this MOU, the Department and MDC share various resource management responsibilities through specific programs. It is under MDC's RAM program that the Department's probabilistic-based sampling is carried out (Combes undated). This sampling effort supports MDC and Department trend monitoring as well as CWA Section 305(b) and 303(d) reporting requirements.

MDC's RAM program monitors approximately 100 stream sites annually from third to fifth order streams. From 2004 to 2008, up to 40 sites were randomly sampled from ecological drainage units on a rotating basis. However, in 2010 sampling focused on aquatic subregions rather than ecological drainage units. To ensure all regions of the state are monitored effectively, sampling is conducted on a five-year cycle where two years are spent monitoring streams in the Central Plains subregion, two years in the Ozark subregion, and one year in the Mississippi Alluvial Basin subregion (Figure 1). The RAM program assesses stream habitat, aquatic invertebrate and fish communities, and water quality at each stream site. Metrics for assessing the biological integrity of fish communities were developed for only Ozark and Ozark border streams (Doisy *et al.* 2008). MDC may also report potentially impaired sites to the Department for additional monitoring. The Department is looking to develop a probability-based survey program that may include low flow surveys and fish tissue contaminants in order to support statewide water body assessments.

Monitoring Program Evaluation

The above components to the Department's water quality monitoring program chart the course for a comprehensive assessment of state waters. Additional elements of the program such as core and supplemental indicators, quality assurance, data management, data analysis and assessment, reporting, and general support and infrastructure are listed in Missouri's "Surface Water Monitoring Strategy" (MDNR 2013).

Monitoring has generally been able to keep pace with critical point source assessment needs and has done a good job of characterizing regional water quality unimpaired by point source discharges; however, the size and scope of the Department's monitoring has fallen short of the state's information needs. With the advent of large CAFOs in Missouri, concern over eutrophication of our large recreational lakes, and continuing urban sprawl, among other problems, have produced questions our present monitoring program is incapable of answering. This inadequacy is demonstrated in part, by the fact that only 34 percent of Missouri's classified stream miles are considered to be monitored, while 57 percent remain unassessed.

Information gaps and data needs are highlighted in Missouri's "Surface Water Monitoring Strategy" document. Among the major monitoring needs identified in this strategy are water chemistry, biological, and habitat monitoring of Great Rivers and large rivers; wetland inventory, monitoring and assessment; bacterial monitoring of large reservoirs and biological criteria development for small reservoirs and lakes; screening level stream surveys for intermittent streams and additional chemical monitoring of small wadeable streams. With additional resources these data needs may begin to be addressed.

Data Acquisition and Information Sharing

The Department retrieves a large amount of raw data from the USGS and a number of other state, federal, and municipal sources. This data along with the Department's, is imported to and maintained in the Department's Water Quality Assessment (WQA) database. Data includes information pertaining on water chemistry, bacterial concentrations, sediment toxicity, fish tissue contaminants, and fish and invertebrate communities. The WQA database is available to the public online at http://www.dnr.mo.gov/mocwis_public/wqa/waterbodySearch.do.

Missouri uses the internet-based WQA system for tracking and reporting water body use attainment information. The stream and lake network of the state, water quality standards information, and locations of permitted wastewater discharges and other potential pollutant sources can all be viewed within a Geographic Information System (GIS) (ArcView) environment. The Department has developed an interactive map viewer and query tool for public use that displays a range of geographic information and is available at www.dnr.mo.gov/internetmapviewer/.

ESP has developed a bioassessment database that provides access to raw data and summarized statistics for all quantitative macroinvertebrate sampling it has completed. This database is typically updated following each season of sampling and the most recent version is available to the public online at www.dnr.mo.gov/env/esp/biologicalassessments.htm.

The Department has a variety of additional information regarding water quality and conservation programs in the state on its website at www.dnr.mo.gov/water.htm. Some of the available information includes current and proposed NPDES permits, Missouri's water quality standards and the latest LMD, a list of impaired waters and TMDLs, and opportunities for water resource conservation and grant opportunities.

Access to the Department's water quality data is relatively straight forward using online tools. Should additional assistance be needed, general requests for water quality information may be made by calling 1-800-361-4827. Official requests for specific information can be made by submitting an online request form found at http://www.dnr.mo.gov/sunshinerequests.htm. Specific requests that cannot be easily accommodated by the online public database may require the Department to search published reports or water quality data files. If the report or data was generated by the Department, it can be sent to the requestor through electronic mail or regular mail (a hard copy for small reports and data files, or compact disks for larger data files). If the report or data file did not originate with the Department, the request may be passed on to the organization that published the report or data. The requestor is welcome to visit the Department office at 1101 Riverside Dr. in Jefferson City and view files directly.

Requests to view water quality data files, should be sent to:

Missouri Department of Natural Resources
Water Protection Program
ATTN: Ms. Trish Rielly
P.O. Box 176
Jefferson City, MO 65102-0176
Phone: (573)526-5297 Fax: (573)526-6802
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C.2. Assessment Methodology

Water quality is judged by its conformance with Missouri's water quality standards. This section describes procedures used by the Department to rate the quality of Missouri's waters under this approach, which includes an explanation of the types of data used to determine designated use attainment, how that data is used, and how findings are reported. The assessment methodology is the process the Department uses for meeting requirements of CWA Sections 305(b) and 303(d), and it is the basis for summary tables and appendices provided later in this document.

Information Used to Determine Designated Use Attainment

To determine whether or not each designated uses is supported, all quality water body specific monitoring data and other relevant information is reviewed against applicable criteria. Monitoring data generated under the four strategic monitoring approaches mentioned in Section C.1. are a key part of the assessment process. The Department also utilizes data from many other external sources that are monitoring for similar purposes and are determined to produce data of acceptable quality. Federal agencies most often collecting such data include USGS, USEPA, USFS, USFWS, the USACE and the National Park Service. Other contributors of data include resource agencies from Illinois, Iowa, Kansas, Arkansas, and Oklahoma; several of the state's larger cities; selected projects from graduate level researchers; MDC fish kills and pollution investigation reports; county public health departments; and, data collected by wastewater dischargers as a condition of their discharge permits (this data may not be used for 303(d) listing purposes). For a complete list of data types and sources, please see Missouri's 2014 LMD, *Methodology for the Development of the 2014 Section 303(d) List in Missouri* (Appendix A).

Water Body Segments

Tables G and H of Missouri's Water Quality Standards published in 10 CSR 20-7.031 contain classifications and use designations for all classified lakes and streams. Each individual waterbody listing in Tables G and H is considered an assessment unit. For each lake in Table G there is only one listing unit. For streams however, single systems may receive multiple classifications according to the character of their natural flow regime (e.g., permanent flow vs. intermittent flow); thus, there may be multiple listings or assessment units in Table H for any given stream or river. For the Mississippi River, water body segments reflect an interstate MOU between five states (Missouri, Illinois, Iowa, Wisconsin, and Minnesota) signed in September, 2003 (UMRBA 2003). The purpose of the MOU is to enhance coordination of water quality assessments and management decision on the Upper Mississippi River, segmentation points are as follows: Des Moines River-Lock and Dam 21-Cuivre River-Missouri River-Kaskaskia River-Ohio River. Results of UAAs and CWC rulings have affected the designation of recreational uses on the Mississippi River, from the Ohio River to the Missouri River, resulting in further subsegmentation. Both specific and general criteria may be applied to classified waters of the state. Unclassified waters are usually assessed against general (narrative) criteria and a subset of specific criteria commonly associated with acute toxicity to aquatic life. There is less available data on unclassified waters, and except for 15 streams and lakes, these waters are normally not reported for 305(b) and 303(d) purposes.

Each water body is assessed individually. For each water body, all available data of acceptable quality is reviewed and assessed. That assessment may then be extrapolated to the entire spatial extent of that classified segment. However, the final extent of the assessment may be adjusted to account for significant influences in point source discharges, extreme changes in land use and stream characteristics, and significant hydrologic and channel modifications. In order to adjust the final extent of an assessment, multiple sample points are needed. Occasionally, this method results in assessments that are shorter than the full spatial extent of the classified water body.

C.2.1. Determining Designated Use Attainments

Unique sets of criteria are used to protect specific designated uses assigned to individual waters. Protective criteria include a range of physical, chemical and biological parameters. This means that in order to determine a level of attainment for a designated use, certain types of data must be collected to compare to those protective criteria. Assessing most designated uses involves analyzing multiple parameters, but in some cases, exceeding a single criterion is enough evidence to rate a use as impaired. All classified waters of the state, including significant public lakes, are designated to be protected for whole body and/or secondary contact recreation, aquatic life, fish consumption by humans, and livestock and wildlife watering. A subset of these waters is protected for drinking water supply, irrigation and industrial process, and cooling water.
This section describes how data and information is used by the Department to assess each of these designated uses. For each classified water body, and for each applicable designated use to that water body, Department assessments result in one of four possible outcomes and are reported as follows:

1) designated use is fully attained;
2) designated use is not attained;
3) designated use not assessed due to an inadequate data; or
4) designated use not assessed.

Generally, a water body use assessment result of "fully attained" suggests water quality is fair to excellent, whereas, an assessment of "not attained" indicates poor water quality. To what extent resource quality is impacted depends on the degree to which the use is not attained. Designated uses identified as "not attained" are considered impaired, and waters with at least one use assessed as "not attained" are considered impaired. When possible, potential or known causes and sources of the impairment are described.

To make a determination of "fully attained" or "not attained," data from the previous seven years is normally used. In some cases however, older data is used when it is believed to be representative of present day conditions.

For complete assessment methodology details please see Missouri's 2014 LMD, *Methodology for the Development of the 2014 Section 303(d) List in Missouri* (Appendix A). The 2014 LMD lists all data that may be used for performing water quality based assessments and the applicable statistical methods for interpreting Missouri's water quality standards. Prior to each listing cycle, the LMD goes through a stakeholder input and review process where it can be revised. Development of the 2014 Section 303(d) List and Section 305(b) report was based exclusively on the 2014 LMD. The 2014 LMD and proposed 2016 LMD may also be viewed at www.dnr.mo.gov/env/wpp/waterquality/303d.htm .

Statistical Considerations

For designated use assessment methods, a specific set of statistical procedures are used to determine if exceedences resulting in non-attainment warrant a 303(d) listing. Table B-1 in the 2014 LMD lists all statistical considerations and analytical tools the Department uses for listing waters as impaired. For each analytical tool, a specific decision rule and test procedure is provided. Procedures outlined in the LMD are based on data that meet quality assurance and control standards.

Additional Approaches for Determining Designated Use Attainment
While specific designated use assessment procedures are contained in the LMD, there are several approaches that may be applied to all designated uses. Designated use protection may be accomplished in the absence of data, if the stream being assessed has similar land use and geology as a stream that has already received a water quality assessment. In such cases, the same rating must be applied to the stream being assessed, and this information may only be used for 305(b) reporting, not 303(d) listing. Additionally, where models or other dilution calculations indicate noncompliance with allowable pollutant levels, waters may be added to Category 3B (See section *C.2.2. Water Body Assignment Categories*) and considered a high priority for water quality monitoring. For assessing narrative criteria for all designated uses, data types that are quantifiable can be used. Full attainment with water quality standards is achieved when the stream appearance is typical of reference or control streams in that region of the state. For example, if water color measured using the platinum-cobalt method is significantly higher than an applicable reference stream, the water body would be judged to be in non-attainment of water quality standards.

The Department reserves the use of best professional judgment for interpreting data that has been influenced by abnormal weather patterns and/or situations that complicate appropriate interpretation of the data. In some cases, this means data that would normally be adequate to assess a use is actually determined to be inadequate, and additional sampling is required to ensure a confident assessment.

C.2.2. Water Body Assignment Categories
Once all attainment decisions have been made for a given water body, it is then categorized according to a degree of compliance with water quality standards. The Department utilizes a five part category system which is helpful for reporting attainment of applicable water quality standards, and to develop monitoring strategies that respond to resource issues identified in the assessment. The five part categorization process is summarized below.

Category 1: All designated uses are fully attained.

Category 2: Available data indicates that some, but not all of the designated uses are fully attained.

Subcategory 2A: Available data suggests compliance with Missouri's Water Quality Standards. No impairment is suspected.

Subcategory 2B: Some available data suggests noncompliance with Missouri's Water Quality Standards. Impairment is suspected.

Category 3: There is insufficient data and/or information to assess any designated uses.

Subcategory 3A: Available data suggests compliance with Missouri's Water Quality Standards. No impairment suspected.

Subcategory 3B: Available data suggests noncompliance with Missouri's Water Quality Standards. Impairment is suspected.

Category 4: Available data indicate that at least one designated use is not attained, but a TMDL study is not needed.

Subcategory 4A: Any portion of the water is in non-attainment with state Water Quality Standards due to one or more discrete pollutants and USEPA has approved a TMDL.

Subcategory 4B: Any portion of the water is in non-attainment with state Water Quality Standards due to one or more discrete pollutants, and pollution control

requirements (i.e., water quality based permits and/or voluntary watershed control plans) have been issued that are expected to adequately address pollutant(s) causing the impairment.

Subcategory 4C: Any portion of the water is in non-attainment with state Water Quality Standards and a discrete pollutant(s) or other property of the water does not cause the impairment.

Category 5: At least one discrete pollutant has caused non-attainment with Missouri's Water Quality Standards, and the water does not meet the qualifications for listing as either Category 4A or 4B. Category 5 waters are those that are candidates for the state's 303(d) List.

For 303(d) assessment purposes, each data type (i.e., bacterial, toxic chemical, fish bioassessment) undergoes a special statistical treatment to determine compliance with water quality standards.

The Department uses a weight of evidence analysis for assessing narrative criteria with numeric thresholds to determine the existence or likelihood of a use impairment and the appropriateness of proposing a listing based on narrative criteria. For Tier Three waters, which includes outstanding state and national waters, no level of water quality degradation is allowed; therefore, assessment of these waters generally compare current data to either historical data or data from segments that support water quality conditions that existed at the time the state's antidegradation rule was promulgated, April 20, 2007. In line with earlier guidance from USEPA, the Department uses a burden-of-proof approach in its hypothesis testing that places emphasis on the alternative hypothesis. In other words, there must be very convincing data to conclude the null hypothesis, that no impairment exists, is not true.

C.2.3. De-listing Impaired Waters

Several factors may lead to removing a water body from the Section 303(d) list. Removal may occur when a TMDL study addressing all pollutant pairs for a given waterbody has been completed and approved. In situations where an impairment is due solely to a permitted facility, it may be possible to revise the facility's permit to meet the targeted water quality criteria, this is known as a Permit in Lieu of TMDL. Waters that recover from pollution may be de-listed once water quality is assessed as meeting water quality criteria. Analytical tools used for de-listing purposes are described in Appendix B of Missouri's 2014 LMD, *Methodology for the Development of the 2014 Section 303(d) List in Missouri* (Appendix A). Occasionally, waters are removed as a result of finding inaccuracies in the original listing.

C.2.4. Changes to the 2014 Listing Methodology Document

Noted earlier, the LMD may be revised every even numbered year, undergoing the same review and approval schedule as that required for the Section 303(d) list. There were numerous changes made to the 2014 LMD in order to account for improved or new assessment procedures. Below is a summary of those revisions, please see the 2014 LMD for exact details related to each change.

- For placing waters into Category 1 (page 3), at least three samples of higher trophic level fish meeting fish tissue mercury guidelines were needed, but in 2014, that was changed to include only samples of higher trophic level species.
- DNR Quality Assurance/Quality Control Program, page 14, additional requirements were added which allow the Department to make a judgement on the acceptability of a quality assurance program.

- Table 1.1 on page 17, the protection of groundwater was included as a beneficial use and an *E. coli* concentration of 126 counts/100 ml was listed as the appropriate criterion.

- Footnote 10 on page 18 was changed to "nutrient criteria will be used in the 2014 LMD only if these criteria appear in the Code of State Regulations, and have not been disapproved by the U.S. Environmental Protection Agency."

- Footnote 14 on page 20, the second to last sentence was changed to, "Where multiple sediment contaminants exist, the Probable Effect Concentrations Quotient shall not exceed 0.75.

- Table 1.2 on page 21, existing compliance standards were designated for only macroinvertebrate data, and new compliance standards were established for fish and other biological data.

- Footnote 16 on page 21 was added to indicate the literature used for Index of Biotic Integrity (IBI) scoring.

- Table B-1 on page 29, a sediment quotient of 0.75 was listed as the new decision making rule for determining toxicity to aquatic life as a result of multiple chemicals in sediment.

- Table B-3 on page 33, values changed for Type I error rates and number of samples meeting standards.

- Appendix D on page 35, values in the example for how to calculate the Probable Effect Concentration Quotient changed. In the final paragraph, decision making rules for determining sediment toxicity were clarified, including a 150 percent evaluation value for assessing Probable Effect Concentrations, and 0.75 to be used as the evaluation value for assessing sediment quotients.

C.3. Assessment Results

This section is a summary of the Department's surface water assessments for the 2014 assessment cycle. Included in this section is the allocation of designated uses among classified waters, assessment results per monitored and evaluated waters, summary of lake trophic conditions and water quality trends, results of the five-part categorization of surface waters and probability based surveys, the Section 303(d) list, and designated use support summaries.

In Tables G and H of Missouri's Water Quality Standards, all classified lakes and stream segments are identified. Classified waters are designated for recreation, aquatic life and fish consumption, and livestock and wildlife watering, with some waters receiving additional designations as described earlier. Aquatic life and fish consumption designated uses have been combined for assessment purposes. Table 2 below, summarizes designated uses allocated among classified waters in the state.

Table 2. Allocation of designated uses among Missouri's classified waters.

Designated Use	Stream miles	Percent of Total	Lake acres	Percent of Total
Aquatic Life and Fish Consumption	24,491	100	303,014	100
Warm-Water Fishery	20,936	85	291,782	96
Cool-Water Fishery	3,257	13	0.0	0
Cold-Water Fishery	298	1	11,232	4
Whole Body Contact Recreation – A	6,181	25	271,505	90
Whole Body Contact Recreation – B	17,639	72	31,509	10
Secondary Contact Recreation	9,435	39	256,733	85
Livestock and Wildlife Watering	24,482	100	303,014	100
Drinking Water Supply	3,455	14	133,692	44
Industrial	1,634	7	6,959	2
Irrigation	4,519	18	0.0	0
Antidegradation				
Outstanding National Resource Waters	202	1	0.0	0
Outstanding State Resource Waters	201	1	270*	0.1
Total Classified Waters	24,491		303,014	

**Denotes acreage for three marsh wetlands.*

Surface Water Monitoring and Assessment Summary

Designated use assessments were supported by departmental monitoring efforts as described in section C.1., as well as data collected by numerous federal, state, and municipal programs. Due to the state's vast stream and lake network, it's not possible to collect adequate data on every classified water body in Missouri; thus, only a portion of all classified waters are monitored each assessment cycle. An overview of stream and lake data used for assessment decisions is provided in Tables 3 and 4.

Table 3. Data availability for assessed and unassessed classified streams in Missouri, 2007-2012.

Assessment Result	**Monitored (miles)**	**Evaluated (miles)**	**Total Assessed**
Full Support of Assessed Uses	3,810	1,005	4,814
Impaired for One or More Uses	4,879	780	5,659
Inadequate Data for Use Assessment	503	1,234	--
Total Assessed	--	--	10,473
Total Unassessed	--	--	14,018

Table 4. Data availability for assessed and unassessed classified lakes in Missouri, 2007-2012.

Assessment Result	Monitored (acres)	Evaluated	Total Assessed
Full Support of Assessed Uses	185,878	2,264	188,142
Impaired for One or More Uses	70,036	336	70,372
Inadequate Data for Use Assessment	7,551	3,547	--
Total Assessed	--	--	258,514
Total Unassessed	--	--	44,500

Monitored waters include streams and lakes where sufficient water quality data for an assessment has been collected in the past five years. Approximately 34 percent of all classified stream miles and 84 percent of all classified lake acres are considered to be monitored. Evaluated waters are those waters which have not been adequately monitored in the past five years. Either older data is available that is still considered representative of present conditions, or they have geology and land use similar to nearby monitored waters and their water quality condition is assumed to be similar as well. Seven percent of all classified stream miles and less than one percent of all classified lake acres are considered to be evaluated. Unassessed waters are those waters that are not monitored directly and do not have nearby waters with similar geology and land use that are monitored. Thus, these represent the classified waters in the state for which an accurate assessment of water quality condition is not possible. Fifty-seven percent of classified stream miles and 15 percent of classified lake acres are considered unassessed.

Probability Summary

Data generated by MDC's RAM program served as the primary source of the Department's probability based survey. Specifically, Fish IBI scores were used to determine the percentage of streams that fully support aquatic life use. For this survey, data was restricted to 3rd to 5th order streams in the Ozark subregion that were randomly selected and assessed from 2002-2010 (Figure 1). Only IBI scores with accompanying habitat assessments were used. In cases where poor stream habitat quality existed and the fish community was not fully supported, data was excluded from further analysis. Therefore, resulting fish IBI scores are reflective of water quality condition in the stream. Fish IBI scores greater than 36 indicate aquatic life use was supported, whereas scores of 29-36 indicate a community is suspected to be impaired but is at least partially in attainment, and scores less than 29 suggest the community is impaired and aquatic life use is not supported. Habitat scores were based on 6 separate metrics: (1) substrate quality, (2) channel disturbance, (3) channel volume, (4) channel spatial complexity, (5) fish cover, and (6) tractive force and velocity. Together these six metrics make up the QCPH1 score, which to date, is the best overall indicator of habitat condition as assessed using MDC's RAM protocol. Final selection of Fish IBI scores incorporated MDC staff's best professional judgment to insure surveys were not compromised in any fashion.

IBI scores from 192 fish surveys representing approximately 2,590 miles were used in this summary. Classified streams 3rd to 5th order in size contribute to approximately 9,843 stream miles in the Ozarks. Complete results are provided in Table 5.

Table 5. Probability based support summary of aquatic life use in Ozark Streams.

Project Name	MDC RAM Program
Type of Waterbody	Stream
Target Population	3rd to 5th Order, Ozarks Ecoregion
Size of Target Population #sites/miles	192 assessments / 2,589.9 miles
Units of Measurement	Classified streams miles
Designated Use	Aquatic Life
Percent, Miles Attaining	71.4%, 7,048 miles
Percent, Miles Not Attaining	14.1%, 1,437 miles
Percent, Miles Non Response (Suspect)	14.6%, 1,388 miles
Indicator	Biological – Fish IBI
Assessment Date	11/8/2013

Lake Trophic Status

In Missouri, trophic state classification is based on chlorophyll-a and total phosphorus measurements. Trophic state is an indicator of a lake's water quality condition in response to nutrient concentrations. The Department utilizes four classes for categorizing lakes by trophic state, including: oligotrophic, mesotrophic, eutrophic, and hypereutrophic. Oligotrophic lakes tend to be low in nutrients and chlorophyll-a concentrations, whereas hypereutrophic lakes contain the highest levels of nutrients and total chlorohyll-a concentrations. Nutrient levels in lakes are the result of both natural processes and anthropogenic influence. The process by which lakes are enriched with nutrients is known as eutrophication, which is typically accelerated by human activities, particularly in agricultural and urban landscapes.

Chlorophyll-a is the green pigment present in all plant life and is necessary for photosynthesis. The amount present in a lake depends on the amount of algae and thus, is a good measure of water quality conditions. Total phosphorus is comprised of soluble phosphorus and the phosphorus in plant and animal fragments suspended in water. Phosphorus is the most limiting nutrient for algae growth in most reservoirs in Missouri.

Chlorophyll-a and total phosphorus values are translated to lake trophic classifications using Table 6. Missouri lakes may be grouped into one of four trophic classes including oligotrophic, mesotrophic, eutrophic, and hypereutrophic. The method presently used by the Department to determine trophic status was derived from work by Wetzel (1975); Vollenweider and Kerekes (1980), and USEPA (1980).

Table 6. Lake trophic classifications defined by chlorophyll-a and total phosphorus concentrations.

Trophic Class	Chlorophyll-a (µg/L)	Total Phosphorus (µg/L)
Oligotrophic	< 3	< 10
Mesotrophic	3-10	10-30
Eutrophic	11-56	31-100
Hypereutrophic	> 56	> 100

In this report, the trophic status summary was updated to account for data collected in 2012. Trophic status was calculated by averaging seasonal values of chlorophyll-a and total phosphorus. Measurements were taken near the deepest part of the lake or just upstream of a reservoir dam,

usually three to four times between May and August. Summarized results are presented in Table 7. For lake specific trophic status, please see Appendix D.

Table 7. Lake trophic class summary for natural divisions in Missouri.

Trophic Class	Glaciated Plains		Ozark Border		Osage Plains		Ozark Highlands		Mississippi Lowlands	
	#	acres	#	acres	#	acres	#	acres	#	acres
Oligotrophic	--	--	3	156	--	--	10	601	--	--
Mesotrophic	17	2,640	9	837	2	250	20	81,380	--	--
Eutrophic	74	39,798	18	8,820	27	5,926	16	124,340	1	33
Hypereutrophic	19	2,397	5	327	5	1,688	--	--	1	--
Total	110	44,835	35	10,140	34	7,864	46	206,321	2	33

Note: Numbers of individual lakes include both classified and unclassified waters; whereas, lake acreages represent only classified lakes.

Trophic status was summarized for 227 classified (194) and unclassified (33) lakes, predominantly reservoirs and oxbow lakes. On average, nine years of data were available per lake, with a range of one to 24. Trophic classes were grouped by natural divisions with distinct combinations of soils, bedrock geology, topography, plant and animal distribution and presettlement vegetation (Thom and Wilson 1980). Natural region divisions are very similar to the primary ecological sections of the classification system developed by Nigh and Schroeder (2002). Based on only classified lakes that were sampled at least once since 1989, the following may be concluded: approximately 757 (0.3%) acres of lakes are classified as oligotrophic; 85,107 ac. (31.6%) are mesotrophic; 178,917 ac. (66.5%) are eutrophic; and, 4,412 ac. (1.6%) are hypereutrophic.

Figure 2. Natural regions of Missouri (Thom and Wilson 1980).

Trophic status correlates strongly with physiographic sections of the state. Oligotrophic lakes reside predominantly in the Ozark Highlands (Ozarks) where the mostly the forested landscape contributes few nutrients through nonpoint sources. Within the Glaciated and Osage Plains sections where agriculture is a predominant land use, both eutrophic and hypereutrophic lakes are encountered more frequently.

Lake Trends

Lake trends were summarized across physiographic sections (Table 8). Only lakes with at least 20 years of data were evaluated, except Binder Lake (Cole County) which had been monitored for 18 years. Fifteen lakes contributed to the Glacial Plains section, 12 to the Ozark Highlands, three to the Osage Plains and two to the Ozark Border section. Lakes were monitored for secchi-disk depth, total phosphorus, total nitrogen, chlorophyll-a, and non-volatile and volatile suspended solids. Linear regression was used to evaluate each parameter over the monitoring period, the slope of the regression line indicated any trend direction, and trends were significant at $p < 0.05$.

Table 8. Summary of lake trends for four physiographic sections in Missouri.

Region	Secchi m/yr	TP µg/L/yr	TN µg/L/yr	CHL-a µg/L/yr	NVSS mg/L/yr	VSS mg/L/yr
Glacial Plains	0.0021	-0.017	3.20	0.277*	-0.105*	0.029
Osage Plains	0.0003	0.221	0.44	0.513	-0.204*	0.044
Ozark Border	-0.021*	0.225	2.93	0.985*	-0.042	0.154*
Ozark Highlands	0.0107	-0.187	-3.63*	0.036	-0.039*	-0.003

**Denotes significant trends (p < 0.05); TP = Total Phosphorus; TN = Total Nitrogen; CHL-a = Chlorophyll-a; NVSS =Nonvolatile Suspended Solids; VSS = Volatile Suspended Solids*

In the Glacial Plains, there were no significant trends in nutrients and water clarity; however, an increase in the annual concentration of chlorophyll-a was observed, potentially the result of decreasing mineral turbidity over the same period. Available trend information was limited in the Osage Plains and Ozark Border regions, but mineral turbidity (i.e., filterable nonalgal suspended particles) showed a decreasing trend in the three lakes of the Osage Plains. For the two lakes in the Ozark Border region, a decreasing trend in secchi depth was observed, which is likely related to the increasing algae production. In the Ozark Highlands region, decreasing trends in nutrients and mineral turbidity may be associated with reduced rates of soil erosion.

When trophic status was evaluated over the same period, both improving and degrading trends were observed. Noteable changes included three lakes where trophic status changed from eutrophic to mesotrophic (Bowling Green Lake, Brookfield Lake, and Little Prairie Lake), and one lake that changed from eutrophic to hypereutrophic (Kraut Run Lake). For other lakes, trophic condition remained nearly the same from the beginning of the trend period to the end, with only subtle changes in between.

Identifying trends in lake water quality can be complicated by seasonal variations, changing climate conditions, and data limitations. Trending may be further complicated by grouping lakes according physiographic region. For management purposes, lake trends should be tracked on an individual basis. Additional lake information is provided annually by the LMVP and listed on their website at http://www.lmvp.org/.

Controlling Pollution in Lakes

In Missouri, the three primary sources of NPS pollution include agriculture lands, urban areas, and to a lesser extent, abandoned mine lands. The Department operates several programs that address water quality and habitat issues facing lakes and reservoirs in the state. While lake pollution may be addressed through regulatory controls, most activities are volunteer based. As previously discussed, volunteer activities are typically addressed by the Department's NPS program and SWCP. For more information regarding these programs, please see *Water Pollution Control Activities*, section B.3. of this report.

In-lake management techniques that were previously funded under CWA Section 314 can now be funded under CWA Section 319 in the context of an appropriate NPS project. Several in-lake management techniques are eligible for CWA Section 319 funding, including water level drawdown, shading, and biological controls such as fish or insects, and planting or harvesting of aquatic plants. The Department also works with several watershed groups on a regular basis. At least 77 watershed groups have been formed in Missouri. These groups work to educate and inform landowners of threats to water resources in their area, and promote land management practices that minimize NPS pollution.

The Department samples lake water quality as needed, but general monitoring is primarily conducted under two specific programs, those being SLAP and LMVP. Together, these programs monitor well over 100 lakes each year. Funding for both SLAP and LMVP is provided under CWA Section 319. Outreach activities are a major component of LMVP.

TMDLs also help reduce pollution in Missouri lakes and reservoirs. The program began in 1999 and as of December 2012, eight studies have been completed for lakes, focused primarily on reducing nonpoint source pollution contributions. Appendix C shows the proposed schedule of future TMDL studies.

Five-Part Categorization of Surface Waters
Results of the five-part categorization of classified surface waters in Missouri are shown in Table 9. Please see Section C.2.2 for category definitions.

Table 9. Size of surface waters assigned to reporting categories.

	Category										
Water Body Type	**1**	**2A**	**2B**	**3A**	**3B**	**4A**	**4B**	**4C**	**5**	**Total in State**	**Total Assessed**
Streams (mi.)	389	4,067	368	10,946	3,062	546	40	320	4,753	24,491	10,483
Lakes (ac.)	0	187,685	457	44,004	496	2,276	0	0	68,096	303,014	258,514

Note: Waters in categories 3A and 3B are considered unassessed. Discrepencies between Tables 3 and 9 are due to rounding in stream segment lengths.

Designated Use Support Summary
Designated uses assigned to classified lakes and streams were individually assessed using site specific information, and summarized results are shown in Tables 10 and 11. Each designated use (aquatic life and fish consumption; whole body contact recreation A and B; secondary contact recreation; drinking water supply; industrial process and cooling water; irrigation; and, livestock and wildlife watering) were assessed for two levels of support. For waters without existing data, or waters where existing data was insufficient to accurately conclude a support level, designated uses were not assessed. Overall, 11,238 stream miles and 260,050 acres of lakes were assessed for at least one designated use, equating to 45.9 and 85.8 percent of all classified waters, respectively.

Table 10. Designated use support summary for Missouri's classified streams, 2014.

Designated Use	Full Support	Non-Support	Not Assessed	Total Assessed	Total in State
Aquatic Life & Fish Consumption	6,487 26.5%	3,542 14.5%	14,462 59.1%	10,029 40.9%	24,491
Whole Body Contact Rec. - A	1,491 24.1%	941 15.2%	3,749 60.7%	2,433 39.4%	6,181
Whole Body Contact Rec. - B	324 1.8%	1,818 10.3%	15,498 87.8%	2,142 12.1%	17,639
Secondary Contact Rec.	3,116 33.0%	283 3.0%	6,036 64.0%	3,399 36.0%	9,435
Drinking Water Supply	1,413 40.9%	0 0.0%	2,042 59.1%	1,413 40.9%	3,455
Industrial	105 6.4%	0 0.0%	1,529 93.6%	105 6.4%	1,634
Irrigation	1,254 27.7%	0 0.0%	3,265 72.3%	1,254 27.7%	4,519
Livestock and Wildlife Watering	2,794 11.4%	0 0.0%	21,687 88.6%	2,794 11.4%	24,482

Table 11. Designated use support summary for Missouri's classified lakes, 2014.

Designated Use	Full Support	Non-Support	Not Assessed	Total Assessed	Total in State
Aquatic Life & Fish Consumption	154,375 50.9%	68,209 22.5%	80,430 26.5%	222,584 73.5%	303,014
Whole Body Contact Rec. - A	221,427 81.6%	0 0.0%	50,078 18.4%	221,427 81.6%	271,505
Whole Body Contact Rec. - B	95 0.3%	0 0.0%	31,414 99.7%	95 0.3%	31,509
Secondary Contact Rec.	196,599 76.6%	0 0.0%	60,134 23.4%	196,599 76.6%	256,733
Drinking Water Supply	24,676.1 18.5%	44 0.0%	108,972 81.5%	24,720 18.5%	133,692
Industrial	0 0.0%	0 0.0%	6,959 100%	0 0.0%	6,959
Livestock and Wildlife Watering	0 0.0%	0 0.0%	303,014 100%	0 0.0%	303,014

For each designated use identified as nonsupporting, there may be one to several potential contaminants causing the impairment(s) (Tables 12 and 13). The list of potential contaminants in Tables 12 and 13 is based on waters categorized as 4A, 4B, 4C, and 5. Summarized data is based on site-specific information. When a classified stream segment is identified as impaired, the contaminant(s) is usually considered to impair the entire segment length; however, if available

data suggests only a portion of the classified segment is impaired, it is this shorter length which is included in the total impaired stream mileage listed per contaminant, rather than the entire classified segment. When a lake's designated use is impaired however, the entire surface area of the lake is considered impaired per contaminant, rather than a smaller portion in closer proximity to the dam outlet where data is collected.

Table 12. Causes of impairments for designated uses assigned to Missouri's classified streams.

Cause/Impairment Type	Impaired Streams Miles	Percent of Total Miles
Bacteria (Fecal coliform & *E. coli*)	2,490.4	10.17
Low Dissolved Oxygen	887	3.62
Mercury in Fish Tissue	695.2	2.84
Macroinvertebrate Bioassessments	349.5	1.43
Lead	257	1.05
Zinc	124.3	0.51
Cadmium	108	0.44
Sediment/Siltation	93.4	0.38
Fish Bioassessments	84.7	0.35
Temperature	46.5	0.19
Chloride	45.9	0.19
Dissolved Oxygen Saturation	35.6	0.15
pH	35.4	0.14
Cause Unknown	26.2	0.11
Ammonia	16.7	0.07
Total Dissolved Solids	15.5	0.06
Nickel	12.2	0.05
Total Suspended Solids	10.9	0.04
Nutrients	5.6	0.02
Sulfates	4.5	0.02
Chlordane in Fish Tissue	4.4	0.02
Copper	2.4	0.01

Table 13. Causes of impairments for designated uses assigned to Missouri's classified lakes.

Cause/Impairment Type	Impaired Lake Acres	Percent of Total Acres
Chlorophyll-a	44,825	14.79
Mercury in Fish Tissue	25,230	8.33
Total Nitrogen	25,180	8.31
Nutrients/Eutrophication Bio. Indicators	24,364	8.04
Total Phosphorus	861	0.28
Dissolved Oxygen Saturation	246	0.08
Pesticides (Atrazine)	44	0.01

Contaminants that impair each designated use originate from several sources. In some cases, a single source is responsible for providing multiple contaminants to the same water body. Impaired stream miles and lake acreages for each contaminant source are listed in Tables 14 and 15. Summarized information is based on site-specific surveys. While contaminants can usually be identified, monitoring limitations can make it difficult to pinpoint exact sources. Despite such limitations, various pollutant sources have been recognized as causing impairments in Missouri's streams and lakes.

Table 14. Contaminant sources for nonsupported designated uses assigned to Missouri's classified streams.

Source Category	Impaired Stream Miles	Percent of Total Miles
Nonpoint Source, not specified	2,168.8	8.9
Source Unknown	1,090.6	4.5
Atmospheric Deposition	664.0	2.7
Municipal Point Source	571.5	2.3
Urban Runoff and Construction	243.8	1.0
Agriculture	150.6	0.6
Habitat Modification other than Hydromodification	41.3	0.2
Industrial Point Source	12.5	0.1
Recreation Pollution Source	7.5	0.0
Natural Conditions	2.3	0.0
Mining		
Tailings	255.3	1.0
Coal Mining	18.5	0.0
Hardrock, subsurface	2.4	0.0
Hydromodification		
Channelization	66.2	0.3
Flow Regulation and Modification	29.0	0.1
Dam or Impoundment	19.8	0.1

Table 15. Contaminant sources for nonsupported designated uses assigned to Missouri's classified lakes.

Source Category	Impaired Lake Acres	Percent of Total Acres
Nonpoint Source, not specified	44,257.0	14.6
Municipal Point Source	41,747.0	13.8
Atmospheric Deposition	25,260.0	8.3
Source Unknown	580.0	0.2
Dam or Impoundment	246.0	0.1
Urban Runoff and Construction	185.0	0.1
Agriculture	133.0	0.0

Section 303(d) Assessment Results – List of Impaired Waters

Under Section 303(d) of the CWA, states are required to develop lists of impaired or threatened waters every two years. An impaired waterbody is defined as having chronic or recurring violations of numeric and/or narrative water quality criteria. Development of the list is based on assessment methods described in section *C.2.1. Determining Designated Use Attainments* and detailed in the 2014 LMD. Missouri's proposed Section 303(d) list is included in Appendix B.

The proposed 2014 Section 303(d) List of impaired waterbodies includes specific waterbody pollutants, their sources, and estimated impairment size. This proposed list reflects any deletions and additions of water body pollutant pairs since the 2012 Integrated Report. Waterbody pollutant pairs proposed to be removed from Missouri's 2012 Section 303(d) Missouri's are also provided in Appendix B. Waters are typically de-listed when new data shows water quality criteria are no longer exceeded, an assessment method changes or initial listing error is identified, USEPA established or approved a TMDL, or a permit in lieu of a TMDL was approved by USEPA.

In summary, the proposed Section 303(d) List of impaired waters for 2014 includes 381 waterbody pollutant pairs for both classified and unclassified waters. Approximately 4,746 stream miles and 120,454 acres of lakes are categorized as impaired by a specific pollutant. Pollutants most commonly identified include bacteria (114 listings), heavy metals (82), dissolved oxygen (65), and mercury in fish tissue (42). Most common pollutant sources include nonpoint source runoff (agriculture, urban, rural, unspecified nonpoint sources)(152), mining related impacts (85), atmospheric deposition (43), and municipal WWTPs and point sources (37).

Thirty-seven pollutant pairs from the 2012 Section 303(d) List were removed from the 2014 list. For 26 pairs, de-listing was due to compliance with water quality standards. Compliance with water quality standards was commonly attributed to a new assessment method, but there were instances of system recovery, erroneous listings, and resegmentation of streams. Two approved TMDLs and one permit in lieu of a TMDL resulted in three de-listings. Troublesome Cr. (WBID 0074) was removed after an impaired aquatic macroinvertebrate community was linked to degraded habitat rather than water quality. Please see Appendix B for additional details on de-listed waters.

Waterbodies removed from the Section 303(d) list as a result of an approved TMDL or permit in lieu of a TMDL, but still assessed as impaired due to noncompliance with water quality standards are listed in Appendix E. These waters are categorized as 4A, 4B, or 4C.

TMDL Schedule

Under 40 CFR Part 130.7(b), states are required to submit a priority ranking schedule that identifies all waters targeted for TMDL development in the next two years. Each water body-pollutant combination listed in the Section 303(d) list must receive a clear priority ranking. USEPA guidance also encourages states to develop TMDLs for each water body-pollutant combinations in a time frame that is no longer than eight to 13 years from the time the water body-pollutant pair was first listed.

Several factors are considered when prioritizing TMDL development, including but not limited to: the potential threat to public health, data availability and timing of acquisition; Our Missouri Waters Initiative; level of public interest; and, initial date of water body-pollutant listing. Appendix C shows each water body-pollutant pair scheduled for a TMDL study through 2026. This TMDL development schedule replaces all schedules previously submitted to USEPA by the

Department. The TMDL schedule will periodically be reviewed an updated to incorporate and reflect new information and shifting priorities, including new 303(d) listing cycles.

C.4. Wetlands Programs

Waters of the state identified as wetlands are those that meet criteria in the *United States Army Corps of Engineers Wetlands Delineation manual 1987*. Missouri's current water quality standards lack designated uses for wetlands and subsequently any numeric water quality criteria; however, as waters of the state, narrative criteria do apply to wetlands. Of the 624,000 estimated wetland acres in the state, three wetland marshes totaling 270 acres are listed as lakes and are considered Outstanding State Resource Waters. Additional information regarding about wetlands in Missouri may be found at http://dnr.mo.gov/env/wrc/wetlands.htm.

Wetlands meeting criteria in the *United States Army Corps of Engineers Wetlands Delineation manual 1987* are protected under CWA Sections 404 and 401. Persons seeking to alter wetlands through "dredge or fill" impacts (e.g. installing culverts or rip-rap, rerouting streams, wetland fill for development purposes, etc.) must apply for a Section 404 permit with USACE; in conjunction, the applicant must also obtain a Section 401 Water Quality Certification from the Department ensuring water quality standards will not be violated and/or appropriate mitigation steps will be taken when impacts are unavoidable.

The Department's WPP, under direction by the Missouri CWC and USEPA, is working to establish water quality standards for wetlands. The WPP has been awarded a Wetland Program Development Grant by USEPA with the goal of establishing a set of reference wetlands in Missouri. In the process, this project will develop methods to identify other candidate reference wetlands using onsite water chemistry and biological sampling. Ultimately, reference wetland information will be used as the basis for developing wetland water quality standards and establishing an IBI for wetlands.

The Department's Water Resources Center administers the State Wetlands Conservation Plan, which encourages the protection and restoration of wetlands and provides technical assistance to other agencies involved in wetland issues. With the help of state and federal agencies, and a strong partnership with University of Missouri, the Department has completed several projects, including studies assessing urban wetlands, identifying types of wetlands through image analysis, wetland nutrient monitoring, determining the hydrology of Missouri riparian wetlands, and an assessment of specific wetland mitigation sites. Continuous monitoring of wetland hydrology is conducted at six sites in the state.

Numerous state and federal wetland projects have been undertaken to protect and enhance Missouri's wetland resources. Together MDC, USFWS and NRCS have protected more than 260,000 acres of wetlands through easements or purchases, restored more than 43,000 acres, and enhanced more than 41,000 acres in Missouri.

C.5. Public Health Issues

USEPA asks states to provide information on public health issues, including information on drinking water supply, whole body contact recreation, and fish consumption advisories. Procedures for determining attainment of each use is provided in section C.2.1, *Determination of Designated Use Attainments*. Please see Tables 10 and 11 for designated use support summaries related to drinking water supply, whole body contact recreation, and fish consumption uses.

Drinking water supply usage is designated for 3,455 stream miles and 133,692 lake acres. This use is not supported in two lakes, Lewistown Lake (Lewis Co., 35 ac.) and Wyaconda Lake (Clark Co., 9 ac.). In both cases, the contaminant is atrazine due to local herbicide applications.

All classified lakes and streams are designated for fish consumption use. For streams, 699.6 miles are impaired due to contaminants in fish tissue. In 11 of 12 streams, the contaminant is mercury and in a single stream (Blue River, Jackson Co.) the contaminant is chlordane. Twenty-six classified lakes covering a total of 25,230 acres are impaired by mercury in fish tissue. Mercury is known to make its way to surface waters through atmospheric deposition; whereas chlordane is used as a pesticide and is likely transported to streams during runoff events.

The MDHSS publishes an annual fish advisory and guide for eating fish in state waters. MDHSS's advisory offers guidelines for two populations, all consumers and a sensitive population, which is defined as pregnant women, women of childbearing age, nursing mothers, and children younger than 13. In Missouri, guidelines vary according to water body, fish species and length. Contaminants of concern include mercury, chlordane, lead, and PCBs. For all consumers, recommendations vary from one meal per week, to "Do Not Eat" for specific species from certain rivers. The statewide recommendation for the sensitive population is to eat no more than one meal of fish per month. The complete fish advisory guide for 2013 is available in portable document format at http://health.mo.gov/living/environment/fishadvisory/pdf/fishadvisory.pdf.

E. coli is sampled at a select set of designated swimming beaches in the state park system on regular basis during the recreational season. Swimming is discouraged when the geometric mean of weekly sample results exceed 190 *E. coli* colonies per 100 ml of water. Sampling results and beach notifications can be viewed online at http://www.dnr.mo.gov/asp/beaches/index.html.

PART D. GROUNDWATER MONITORING AND ASSESSMENT

Groundwater resources vary considerably in quantity and quality across Missouri. It's estimated that during normal weather cycles, 500 trillion gallons of drinkable groundwater is stored in Missouri's aquifers (Miller and Vandike 1997). Certain aquifers yield high volumes of quality water, whereas in some areas, groundwater yields are quite low and/or contain water that is too mineralized for consumption. This section provides an overview of significant groundwater resources in the state, groundwater interactions with surface waters, groundwater quality, sources of groundwater contamination, and current monitoring efforts and protection programs.

D.1. Groundwater in Missouri

Approximately 42 percent of Missourians rely on groundwater for drinking water. Groundwater is the primary source of drinking water in the Ozarks and the Southeast Lowlands, for both public and private systems. Cities of St. Joseph, Independence, Columbia, and St. Charles use groundwater from the alluvial aquifer of the Missouri River. In the plains region of the state, many small communities are able to obtain adequate water from shallow alluvial wells near rivers or large creeks, and many individual households still rely on shallow upland aquifers despite small yields.

In the Ozarks, groundwater yields are usually large and of excellent quality, as witnessed by the fact that unlike cities in other areas of the state, many municipalities pump groundwater directly into their water supplies without treatment. However, the geologic character of the Ozarks that supplies it with such an abundance of groundwater, namely its ability to funnel large amounts of rainfall and surface runoff to the groundwater system, can present problems for groundwater

quality. This is because much surface water flows directly to groundwater through cracks, fractures or solution cavities in the bedrock, with little or no filtration. Contaminants from leaking septic tanks or storage tanks, or surface waters affected by domestic wastewater, animal feedlots, and other pollution sources can move directly into groundwater through these cavities in the bedrock.

As in the Ozarks, groundwater in the southeast lowlands is abundant and of good quality. Unlike the Ozarks, contaminants are filtered by thick deposits of sand, silt, and clay as they move through the groundwater system. Shallow groundwater wells however are subject to the same problems of elevated levels of nitrate or bacteria experienced in the Ozark aquifer and can also have low levels of pesticides. Deep wells are generally unaffected by contaminants.

Shallow groundwater in the plains of northern and western Missouri tends to be somewhat more mineralized and to have taste and odor problems due to high levels of iron and manganese. Like shallow wells in the southeast lowlands, wells in this part of the state can be affected by nitrates, bacteria, or pesticides.

In urban areas, alluvial aquifers of large rivers such as the Missouri and the Meramec which serve water supplies have occasionally been locally contaminated by spills or improper disposal of industrial or commercial chemicals.

D.2. Well Construction and Groundwater Quality

Well construction greatly influences the quality of well water and therefore, state regulations include construction standards for both public and private wells. Public drinking water wells and many private wells are deep, and properly cased and grouted. These wells rarely become contaminated. However, many private wells established prior to the development of construction standards are shallow or not properly cased. These wells can be easily contaminated by septic tanks, feedlots or chemical mixing sites near the well. Studies in Missouri have shown that two-thirds of wells contaminated by pesticides are less than 35 feet deep. The three most common problems in private wells are bacteria, nitrate, and pesticides. Water quality criteria for each of these pollutants can occasionally be exceeded in private wells.

D.3. Major Potable Aquifers in Missouri

Locations of major aquifers providing drinkable water in Missouri are described below. Unconfined aquifers are those influenced by water table conditions (the pressure at the water table is the atmospheric pressure), and tend to yield greater amounts of water, but are also more easily contaminated by activities occurring at the land's surface. In confined aquifers, groundwater is overlain by a low permeable geologic material, and groundwater below is under pressure greater than atmospheric pressure alone. Confined aquifers generally recharge more slowly than unconfined aquifers, but are better protected from surface contaminants.

Glacial Till Aquifer

This aquifer covers most of Missouri north of the Missouri River. Glacial till is an unsorted mixture of clay, sand, and gravel, with occasional boulders and lenses of sand or gravel. Loess, fine wind-blown silt deposits four to eight feet in depth, covers till on the uplands. In some places, the till is underlain by sorted deposits of sand or gravel. Although this aquifer is unconfined, surface water infiltrates very slowly and groundwater yields are very small. In scattered areas, the till has buried old river channels that remain as large sand or gravel deposits that contain much more groundwater than the till. Some households rely on these areas for drinking water, but it is generally inadequate as a source for municipal water supply.

Alluvial Aquifer
Alluvial aquifers are the unconfined aquifers on the floodplains of rivers and are of Quaternary age. In Missouri, the largest of these aquifers lie along the Missouri and Mississippi rivers, reaching their widest extent in the southeast lowlands, where they extend as far as 50 miles west of the Mississippi River. Many small communities north of the Missouri River use alluvial aquifers of nearby streams as their drinking water supply, and the Missouri River alluvium supplies the cities of St. Joseph, Independence, and Columbia and sections of St. Charles County. In the southeast lowlands, most private water supplies and about 45 percent of people served by public water supplies use water from the alluvial aquifer. Agricultural irrigation consumes much more water in this area of Missouri than does domestic water use. All agricultural irrigation water is drawn from the alluvial aquifer.

Wilcox-McNairy Aquifers
These two aquifers lie beneath much of the alluvial aquifer of the southeast lowlands. They are in unconsolidated or loosely consolidated deposits of marine sands and clays of Tertiary and Cretaceous age. Except where the McNairy aquifer outcrops in the Benton Hills and along Crowley's Ridge, these aquifers are confined. They yield abundant amounts of good quality water, and they provide water for 55 percent of people served by public supplies. In the southeastern part of this region, the deeper of these aquifers, the McNairy, becomes too mineralized to be used for drinking water supply. These two aquifers appear to be unaffected by contaminants of human origin.

Ozark-St. Francois Aquifer
This aquifer covers most of the southern and central two-thirds of Missouri. It is composed of dolomites and sandstones of Ordovician and Cambrian age. Most of the aquifer is unconfined. This aquifer is used for almost all public and private drinking water supplies in this area of Missouri. Exceptions would include supplies in the St. Francois Mountains, such as Fredericktown and Ironton, where the aquifer has been lost due to geologic uplift and erosion, and near Springfield, where demand is so heavy that groundwaters are supplemented with water from three large reservoirs and the James River.

Yields and water quality are typically very good, but in many areas, the bedrock is highly weathered, contains many solution cavities, and can transmit contaminated surface waters into the groundwater rapidly with little or no filtration. Where the confined portion of the aquifer is overlain only by the Mississippian limestones of the Springfield aquifer, the confined Ozark aquifer continues westward for 80 miles or more as a potable water supply, serving the communities of Pittsburg, Kansas and Miami, Oklahoma. However, where it is also overlain by less permeable Pennsylvanian bedrock, the confined Ozark becomes too mineralized for drinking water within 20 to 40 miles.

The unconfined Ozark-St. Francois aquifer is susceptible to contamination from surface sources. Increasing urbanization and increasing numbers of livestock are threats to the integrity of portions of this valuable aquifer.

Springfield Aquifer
This aquifer covers a large portion of southwestern Missouri. It is composed of Mississippian limestones that are highly weathered, particularly in its eastern extent. The aquifer is unconfined and surface water in many areas is readily transmitted to groundwater. Urbanization and livestock production affect this aquifer. Elevated nitrates and bacterial contamination are common problems in groundwater here.

D.4. Groundwater Contamination, Monitoring, and Protection

Contamination

Major sources of groundwater contamination in Missouri are generally associated with agricultural activities, chemical and waste storage and treatment facilities, industrial and mining processes, and accidental spills. Each contaminant source may lead to one or more contaminants and is typically associated with one or more significant risk factors. Sources of contamination can be prioritized by their contaminants and risk factors, as a result, 10 sources of groundwater contamination are considered priority sources in the state. Please see Table 16 for a list of major sources of groundwater contamination in Missouri, and their related contaminants and associated risk factors.

Table 16. Major sources of groundwater contamination in Missouri.

Contaminant Source	10 Highest Priority Sources (X)[1]	Significant Risk Factors[2]	Contaminants[3]
Agricultural Activities			
Agricultural chemical facilities			
Animal feedlots			
Drainage wells			
Fertilizer applications	X	A,C,D,E	a
Irrigation practices			
Pesticide applications	X	A,B,C,D,E	b
Storage and Treatment Activities			
Land application	X	A,D,E	a,c
Material stockpiles			
Storage tanks (above ground)			
Storage tanks (underground)	X	A,B,C,D,E	d
Surface impoundments			
Waste piles			
Waste tailings			
Disposal Activities			
Deep injection wells			
Landfills			
Septic systems	X	A,D,E	a,c
Shallow injection wells			
Other			
Hazardous waste generators			
Hazardous waste sites	X	A,B,C,D	b,e,f,g
Industrial facilities	X	A,B,C,E	a,h,i,j
Material transfer operations			
Mining and mine drainage	X	A,E	f
Pipelines and sewer lines			
Salt storage and road salting			
Salt water intrusion	X	C	k
Spills	X	A,B,C,E	b,d,e,h
Transportation of materials			
Urban runoff			

[1]Not in priority order.

[2] A. Human health or environmental toxicity risk
B. Size of population at risk
C. Location of sources relative to drinking water sources
D. Number and/or size of contaminant sources
E. Hydrogeologic sensitivity

[3]a. Nitrate
b. Organic Pesticides
c. Pathogens (Bacteria, Protozoa, Viruses)
d. Petroleum Compounds
e. Halogenated Solvents
f. Metals
g. Radionuclides
h. Ammonia
i. Pentachlorophenol
j. Dioxin
k. Salinity/Brine

Monitoring

The Department's Hazardous Waste Program and Public Drinking Water Branch manage activities to protect groundwater and public health. The Department's Water Resources Center is responsible for water quantity issues and operates and maintains a network of 164 groundwater level observation wells for monitoring Missouri's aquifers. While the Department does not

directly administer a single statewide monitoring program for groundwater quality, such data is collected for specific projects and tracked by both department programs.

The goal of the Hazardous Waste Program is to protect human health and the environment from threats posed by hazardous wastes. One of this program's primary functions is to oversee cleanup of contaminated sites, which may be addressed by one of the Department's regulatory programs such as the Comprehensive Environmental Response Compensation and Liability Information System, Leaking Underground Storage Tanks, and Resource Conservation and Recovery Act. Additionally, the program's Federal Facilities Section provides oversight and review of investigations, management and remediation of hazardous substances at facilities currently or previously owned or operated by the Department of Defense or Department of Energy. Furthermore, contaminated sites may be subject to regulation if they are one of the National Priorities Listed sites, cleanup involves underground injections into the aquifer, or they reside on state lands. Table 17 is a summary of groundwater contamination and remediation per source type for 2012 and 2013. More information regarding the Hazardous Waste Program may be found at http://www.dnr.mo.gov/env/hwp/index.html.

Table 17. Groundwater contamination summary for all aquifers, 2012-2013.

Source Type	Number of sites	Number of sites that are listed and/or have confirmed releases	Number with confirmed groundwater contamination	Contaminants*	Number of site investigations (optional)	Number of sites that have been stabilized or have had the source removed (optional)	Number of sites with corrective action plans (optional)	Number of sites with active remediation (optional)	Number of sites with cleanup completed (optional)
NPL	25	25	25	1		-	-	-	-
CERCLIS (non-NPL)	30	30	30	1		-	-	-	-
DOD/DOE	305	37	33	1,2,3,4	38	225	243	18	56
LUST	3,517	249	105	3	105	170	-	1,118	85
RCRA Corrective Action	89	89	55	1,2,3,4	49	39	27	26	16
Underground Injection	22	22	22	1,3	22		22	22	
State Sites	856	856	387	1,2,3,4	847	575	575	49	575
Nonpoint Sources									
Other (specify)									

NPL - National Priority List; DOE - Department of Energy ; DOD - Department of Defense; CERCLIS - Comprehensive Environmental Response, Compensation, and Liability Information System; LUST - Leaking Underground Storage Tanks; RCRA - Resource Conservation and Recovery Act. Underground Injection - includes sites where chemicals were injected into groundwater as part of approved remediation plan.

*Contaminants: 1- VOAs, SVOAs, Solvents, PCBs, Dioxin, PAHs, Herbicides, Pesticides, Metals, Explosives
2- VOAs, PCBs, Pesticides, Dioxin, Metals, Radionuclides, SVOCs, etc.
3- BTEX, TPH, MTBE, PAHs, Metals, SVOA
4- Creosote, Pentachlorophenol, Organic Solvents, Chlorinated Solvents, Petroleum, Asbestos

The WPP's Public Drinking Water Branch ensures all public water systems provide safe drinking water to people. Public water systems utilizing groundwater may test supply wells for compliance purposes. This data is reviewed and stored in the Public Drinking Water Branch's database. In this reporting cycle, groundwater results are presented for 21counties in southwest Missouri that are underlain by the Springfield Plateau groundwater province, also called the Springfield Aquifer. Taney and Douglas counties were excluded from this summary since only a very small portion of each are underlain by the Springfield Plateau groundwater province. Sample parameters were summarized for each public water supply and included nitrate, synthetic organic chemicals (SOCs), and volatile organic chemicals (VOCs). Currently, the Department regulates 41 different SOCs and 21 VOCs. Nitrate and VOC levels were measured at detectable levels at some facilities, however, no exceedences of groundwater standards were observed. Exceedences were determined in accordance with maximum contaminant levels per 10 CSR 60-4.030, 10 CSR 60-1.040 and 10 CSR 60-4.100. Please see Table 18 for a summary of groundwater quality in the Springfield Plateau groundwater province.

Table 18. Groundwater quality sample results reported by public drinking facilities from 21 counties overlying the Springfield Plateau groundwater province, 2010-2013.

County	Reporting Facilities	Facilities with Detections			Facilities with Exceedences		
		NO_3	SOCs	VOCs	NO_3	SOCs	VOCs
Barry	54	21	0	7	0	0	0
Barton	11	3	0	1	0	0	0
Benton	32	16	0	1	0	0	0
Cedar	10	4	0	1	0	0	0
Christian	48	27	0	3	0	0	0
Cooper	7	0	0	0	0	0	0
Dade	6	3	0	0	0	0	0
Greene	46	13	0	3	0	0	0
Henry	2	2	0	0	0	0	0
Hickory	17	5	0	0	0	0	0
Jasper	33	12	0	2	0	0	0
Johnson	5	3	0	0	0	0	0
Lawrence	22	10	0	0	0	0	0
McDonald	18	2	0	0	0	0	0
Newton	22	11	0	1	0	0	0
Pettis	29	14	0	0	0	0	0
Polk	27	13	0	1	0	0	0
St Clair	7	2	0	0	0	0	0
Stone	101	66	0	8	0	0	0
Vernon	8	8	0	1	0	0	0
Webster	15	12	0	1	0	0	0

While the Water Resources Center focuses on water quantity issues regarding availability and usage, this program conducted a statewide screening level survey for pesticides in shallow groundwater wells from 2001 to 2006 (Baumgartner 2006). The purpose of this project was to determine if agricultural pesticides entered groundwater as a result of normal field application. The project focused on four primary pesticides, including: atrazine, simazine, alachlor, and metolachlor. Samples were collected from 190 wells, of which, 186 wells showed no measurable level of specific pesticides. Of the four wells that showed some level of pesticide contamination in groundwater, no samples contained concentrations above maximum contaminant levels listed under USEPA guidelines at that time.

Groundwater Protection

Different programs within the Department are responsible for certain aspects of groundwater protection. Please see Table 19 for a summary of groundwater protection programs or activities carried out by the state of Missouri. Please visit the Department's website at http://www.dnr.mo.gov/ for additional information on specific groundwater protection programs.

Table 19. Summary of groundwater protection programs in Missouri.

Program or Activities	Check (X)	Implementation Status	Responsible State Agency
Active SARA Title III Program	X	Fully Established	MDPS/SEMA
Ambient Groundwater Monitoring System		N/A	
Aquifer Mapping and Characterization	X	Continuing Effort	DNR
Aquifer Vulnerability Assessment		N/A	
Comprehensive Data Management System		N/A	
EPA-Endorsed Core Comprehensive State Groundwater Protection Program		N/A	
Groundwater Best Management Practices	X	Continuing Effort	DNR
Groundwater Classification		N/A	
Groundwater Discharge Permits	X	Fully Established	DNR
Groundwater Legislation	X	Developed	DNR
Groundwater-Level Observation Network	X	Fully Established	DNR
Groundwater Monitoring at Sanitary Landfills	X	Fully Established	DNR
Groundwater Quality Standards	X	Fully Established	DNR
Interagency Coordination for Groundwater Protection Initiatives	X	Fully Established	DNR
Nonpoint Source Controls	X	Continuing Effort	DNR
Pesticide State Management Plan	X	Developed	MDA
Pollution Prevention Program	X	Continuing Effort	DNR
Resource Conservation and Recovery Act (RCRA) Primacy	X	Fully Established	DNR
State RCRA Program Incorporating More Stringent Requirements Than RCRA Primacy	X	Fully Established	DNR
State Septic System Regulations	X	Fully Established	MDHSS
State Superfund	X	Fully Established	DNR
Underground Injection Control Program	X	Fully Established	DNR
Underground Storage Tank Installation Requirements	X	Fully Established	DNR
Underground Storage Tank Permit Program		N/A	
Underground Storage Tank Remediation Fund		N/A	
Vulnerability Assessment for Drinking Water/ Wellhead Protection	X	Fully Established	DNR
Well Abandonment Regulations	X	Fully Established	DNR
Wellhead Protection Program (EPA-Approved)	X	Fully Established	DNR
Well Installation Regulations	X	Fully Established	DNR

MDPS/SEMA: Missouri Department of Public Safety, State Emergency Management Agency
MDA: Missouri Department of Agriculture
MDHSS: Missouri Department of Health and Senior Services

PART E. PUBLIC PARTICIPATION

In accordance with federal CWA regulation and Missouri Revised Statute 644.036.5, the Department provides several opportunities for the public to participate in the development of the Section 303(d) list. The LMD receives public review as well and is approved pursuant to 10 CSR 20-7.050. The public comment period for the proposed 2014 Section 303(d) List and 2016 LMD was opened on October 15, 2013 and closed January 31, 2014. Both documents were posted on the Department's Section 303(d) website at http://www.dnr.mo.gov/env/wpp/waterquality/303d.htm throughout the comment period. Assessment worksheets for proposed water body listings were also included on the webpage. During the comment period, two public information sessions were held at the Lewis and Clark State Office Building in Jefferson City, one on November 13 and another on December 11. Additionally, a public hearing on both the proposed Section 303(d) list and 2016 LMD was held on January 22, 2014 with a member of the Missouri's Clean Water Commission in attendance. Video and audio from the hearing can be found on the CWC's website at http://www.dnr.mo.gov/env/Wpp/cwc/#meetings. The public notice was posted in five major newspapers circulated primarily in and around the cities of St. Louis, Kansas City, Springfield, Kirksville, Columbia, and Cape Girardeau.

Summaries of each information session were posted on the Department's Section 303(d) website following each meeting, and have been included with all administrative records submitted with the Section 303(d) list package to USEPA. During each session, both impaired waterbody listing decisions and the 2016 LMD were reviewed and discussed with members of the 303(d) stakeholder group and others in attendance. The Department responded to all questions and comments received during the public notice period. Responses to public comments regarding the Section 303(d) list are included in Appendix G. Responses to public comments regarding the 2016 LMD will be posted to the Department's Section 303(d) website at a later date. Missouri's Section 303(d) list was approved by the CWC during a public meeting held on April 2, 2014.

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APPENDICES

APPENDIX A

Methodology for the Development of the 2014 Section 303(d) List

See Next Page

Proposed Methodology for the Development

of the

2014 Section 303(d) List in Missouri

Missouri Department of Natural Resources
Division of Environmental Quality
Water Protection Program
Approved by the Missouri Clean Water Commission
May 2, 2012

Missouri
Department of
Natural Resources

Methodology for the Development of the 2014 Section 303(d) List

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I. Citation and Requirements

A. Citation of Section of Clean Water Act

This document is required by revisions of rules under the Federal Clean Water Act, Section 303(d), 40 CFR 130.7, and the timetable for presenting the finished document to the United States Environmental Protection Agency (EPA) and the public is given in Part 130.10. Section 303(d) requires states to list certain impaired waters and the rules require that states describe how this list will be constructed. Missouri fulfills reporting requirements under Section 303(d), 305(b) and 314 of the Clean Water Act by the submission to EPA of an integrated report at the time the 303(d) is approved by the Missouri Clean Water Commission. In years when no integrated report is submitted, the Department of Natural Resources (Department) submits a copy of its statewide water quality assessment database to EPA.

B. EPA Guidance

In July 2003, EPA issued new guidance entitled "Guidance for 2004 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act". This guidance gives further recommendations about listing of 303(d) and other waters. In July 2005, EPA published an amended version entitled "Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act." In October 2006, EPA issued a memorandum entitled "Information Concerning 2008 Clean Water Act Sections 303(d), 305(b) and 314 Integrated Reporting and Listing Decisions." This memorandum serves as EPA's guidance for the 2008 reporting cycle.

The Department is responsible for administration of the Federal Clean Water Act in Missouri. EPA regulations require that the Department describe the methodology used to develop the state's 303(d) List. This draft document should be made available to the public for review and comment. The Department should provide EPA with a document summarizing all comments received and the Department responses to significant comments. EPA's guidance recommends that the Department provide: (1) a description of the methodology used to develop the Section 303(d) List; (2) a description of the data and information used to identify (impaired and threatened) waters, including a description of the existing and readily available data and information used; and (3) a rationale for any decision for not using any existing and readily available data and information. The guidance also notes that "prior to submission of its Integrated Report, each state should provide the public with the opportunity to review and comment on the methodology." The guidelines further recommend that the methodology document include information on how interstate or international disagreements concerning the list are resolved.

Placement of Waters within the Five Categories in the 2006 EPA Assessment, Listing and Reporting Guidance

The guidance issued by EPA in 2005 recommends that all waters of the state be placed in one of five categories.

Category 1

All designated beneficial uses are fully maintained. Data or other information supporting full beneficial use attainment for all designated beneficial uses must be consistent with the state's listing methodology document. The Department will place a water in Category 1 if the following conditions are met:

- The water has physical and chemical data (at a minimum, water temperature, pH, dissolved oxygen and ammonia for streams, and total nitrogen, total phosphorus and secchi depth for lakes) and biological water quality data (at a minimum, *E. coli* or fecal coliform bacteria) that indicates attainment with water quality standards.
- The level of mercury in fish fillets or fish eggs used for human consumption does not exceed fish tissue guidelines of 0.3 mg/kg or less. Only samples of higher trophic level species (largemouth, smallmouth and Kentucky Spotted bass, sauger, walleye, northern pike, trout, striped bass, white bass, flathead catfish and blue catfish, will be used.
- The water is not rated as "threatened".

Category 2

One or more designated beneficial uses are fully attained but at least one designated beneficial use has inadequate data or information to make a use attainment decision consistent with the state's listing methodology document. The Department will place a water in Category 2 if at least one of the following conditions are met:

- There is inadequate data for water temperature, pH, dissolved oxygen or ammonia in streams to assess attainment with water quality standards or inadequate total nitrogen, total phosphorus or secchi data in lakes.
- There is inadequate *E. coli* or fecal coliform bacteria data to assess attainment with the whole body contact recreational use.
- There is insufficient fish fillet tissue or fish egg data available for mercury to assess attainment with the fish consumption use.

Category 2 waters will be placed in one of two sub-categories.

Category 2A: Waters will be placed in this category if available data, using best professional judgement, suggests compliance with numeric water quality criteria of Tables A or B in Missouri's Water Quality Standards (10 CSR 20-7.031) or other quantitative thresholds for determining use attainment.

Category 2B: Waters will be placed in this category if the available data, using best professional judgment, suggests noncompliance with numeric water quality criteria of Tables A or B in Missouri's Water Quality Standards, or other quantitative thresholds for determining use attainment, and this data is insufficient to support a statistical test or to qualify as representative data. Category 2B waters will be given high priority for additional water quality monitoring.

Category 3

Water quality data are not adequate to assess any of the designated beneficial uses consistent with the LMD. The Department will place a water in Category 3 if data are insufficient to support a statistical test or to qualify as representative data to assess any of the designated beneficial uses. Category 3 waters will be placed in one of two sub-categories.

Category 3A. Waters will be placed in this category if available data, using best professional judgement, suggests compliance with numeric water quality criteria of Tables A or B in Missouri's Water Quality Standards (10 CSR 20-7.031) or other quantitative thresholds for determining use attainment.

Category 3B. Waters will be placed in this category if the available data, using best professional judgement, suggests noncompliance with numeric water quality criteria of Tables A or B in Missouri's Water Quality Standards or other quantitative thresholds for determining use attainment. Category 3B waters will be given high priority for additional water quality monitoring.

Category 4

State Water Quality Standards or other criteria, as per the requirements of Table 1 of this document, are not attained, but a Total Maximum Daily Load study is not required. Category 4 waters will be placed in one of three sub-categories.

Category 4A. EPA has approved a Total Maximum Daily Load study that addresses the impairment. The Department will place a water in Category 4A if both the following conditions are met:

- Any portion of the water is rated as being in non-attainment with state Water Quality Standards or other criteria as explained in Table 1 of this document due to one or more discrete pollutants or discrete properties of the water[1], and

[1] A discrete pollutant or a discrete property of water is defined here as a specific chemical or other attribute of the water (such as temperature, dissolved oxygen or pH) that causes beneficial use impairment and that can be measured quantitatively.

- EPA has approved a Total Maximum Daily Load for all pollutants causing that non-attainment.

Category 4B. Water pollution controls required by a local, state or federal authority, are expected to correct the impairment in a reasonable period of time. The Department will place a water in Category 4B if both of the following conditions are met:

- Any portion of the water is rated as being in non-attainment with state Water Quality Standards or other criteria as explained in Table 1 of this document due to one or more discrete pollutants or discrete properties of water, and
- A water quality based permit that addresses the pollutant(s) causing the designated use impairment has been issued and compliance with the permit limits will eliminate the impairment; or other pollution control requirements have been made that are expected to adequately address the pollutant(s) causing the impairment. This may include implemented voluntary watershed control plans as noted in EPA's guidance document.

Category 4C. Any portion of the water is rated as being in non-attainment with state Water Quality Standards or other criteria as explained in Table 1 of this document, and a discrete pollutant(s) or other discrete property of the water does not cause the impairment. Discrete pollutants may include specific chemical elements (e.g., lead, zinc), chemical compounds (e.g., ammonia, dieldrin, atrazine) or one of the following quantifiable physical, biological or bacteriological conditions: water temperature, percent of gas saturation, amount of dissolved oxygen, pH, deposited sediment, toxicity or counts of fecal coliform or *E. coli* bacteria.

Category 5

At least one discrete pollutant has caused non-attainment with state Water Quality Standards or other criteria as explained in Table 1 of this document, and the water does not meet the qualifications for listing as either Categories 4A or 4B. Category 5 waters are those that are candidates for the state's 303(d) List[2].

If a designated use is not supported and the segment is impaired or threatened, the fact that a specific pollutant is not known does not provide a basis for excluding a segment from Category 5. These segments must be listed as Category 5 unless the state can demonstrate that no discrete pollutant or pollutants causes or contributes to the impairment. Pollutants causing the impairment will be identified before a TMDL study is written. The TMDL must be written within the time period allowed for TMDL development in EPA guidelines.

Threatened Waters

When a water that would otherwise be in Categories 1, 2 or 3 has a time trend analysis for one or more discrete water quality pollutants that indicates the water is currently maintaining all

[2] The proposed state 303(d) List is determined by the Missouri Clean Water Commission and the final list is determined by the U.S. Environmental Protection Agency.

beneficial uses but will not continue to meet these uses before the next listing cycle, it will be considered a "threatened water." A threatened water will be treated as an impaired water and placed in the appropriate Category (4A, 4B or 5).

II. The Methodology Document

A. Procedures and Methods Used to Collect Water Quality Data

Department Monitoring

The major purposes of the Department's water quality monitoring program are:

- to characterize background or reference water quality conditions;
- to better understand daily, flow event and seasonal water quality variations and their underlying processes;
- to characterize aquatic biological communities;
- to assess time trends in water quality;
- to characterize local and regional impacts of point and nonpoint source discharges on water quality;
- to check for compliance with Water Quality Standards or wastewater permit limits;
- to support development of strategies, including Total Maximum Daily Loads, to return impaired waters to compliance with Water Quality Standards. All of these objectives are statewide in scope.

Coordination with Other Monitoring Efforts in Missouri

To maximize efficiency, the Department routinely coordinates its monitoring activities to avoid overlap with other agencies and to provide and receive interagency input on monitoring study design. Data from other sources is used for meeting the same objectives as Department sponsored monitoring. The agencies most often involved are the U.S. Geological Survey, the U.S. Army Corps of Engineers, EPA, the Missouri Department of Conservation, and the Missouri Department of Health and Senior Services. The Department also tracks the monitoring efforts of the National Park Service, the U.S. Forest Service, several of the state's larger cities, the states of Oklahoma, Arkansas, Kansas, Iowa and Illinois, and graduate level research conducted at universities within Missouri. For those wastewater discharges where the Department has required instream water quality monitoring, the Department may also use monitoring data acquired by wastewater dischargers as a condition of discharge permits issued by the department. In 1995, the Department also began using data collected by volunteers that have passed Quality Assurance/Quality Control tests.

Existing Monitoring Networks and Programs

The following list is a description of the kinds of water quality monitoring activities presently occurring in Missouri.

1. Fixed Station Network

   A. Objective: To better characterize background or reference water quality conditions, to better understand daily, flow event and seasonal water quality variations and their

underlying processes, to assess time trends and to check for compliance with Water Quality Standards.

B. Design Methodology: Sites were chosen based on one of the following criteria:

- Site is believed to have water quality representative of many neighboring streams of similar size due to similarity in watershed geology, hydrology and land use, and the absence of any impact from a significant point or discrete nonpoint water pollution source.
- Site is downstream of a significant point source or discrete nonpoint source area.

C. Number of Sites, Sampling Methods, Sampling Frequency, and Parameters:

- Department/U.S. Geological Survey cooperative network: 60 sites statewide, horizontally and vertically integrated grab sampled, six to 12 times per year. Samples are analyzed for major ions, nutrients, temperature, pH, dissolved oxygen, specific conductance and flow on all visits, two to four times annually for suspended solids and heavy metals, and for pesticides six times annually at six sites.
- Department raw water sampling of public drinking water reservoirs: nine drinking water reservoirs are sampled ~~4~~ four times per year for some commonly used agricultural herbicides.
- Department/University of Missouri-Columbia's lake monitoring network. This program has monitored about 185 lakes. About 40 lakes are monitored each year. Each lake is usually sampled four times during the summer and about 12 are monitored spring through fall for nutrients, chlorophyll, turbidity and suspended solids.
- Department routine monitoring of finished public drinking water supplies for bacteria and trace contaminants.
- Routine bacterial monitoring (typically weekly during the summer) of swimming beaches at Missouri's state parks during the recreational season by the Department's Division of State Parks.
- Monitoring of sediment quality by the Department at approximately 10 discretionary sites annually. All sites are monitored for several heavy metals and organic contaminants. A pore water sample is analyzed for ammonia, and a Microtox toxicity test is performed on the sediment.

2. Special Water Quality Studies

A. Objective: Special water quality studies are used to characterize the water quality impacts from a specific pollutant source area.

B. Design Methodology: These studies are designed to determine the contaminants of concern based on previous water quality studies, effluent sampling and/or Missouri State Operating Permit applications. These studies employ multiple sampling stations downstream and upstream (if appropriate). If contaminants of concern have significant

seasonal or daily variation, season of the year and time of day variation must be accounted for in the sampling design.

C. Number of Sites, Sampling Methods, Sampling Frequency and Parameters: The Department conducts or contracts for 10 to15 special studies annually. Each study has multiple sampling sites. Number of sites, sampling frequency and parameters all vary greatly depending on the study. Intensive studies would also require multiple samples per site over a relatively short time frame.

3. Toxics Monitoring Program

The fixed station network and many of the Department's intensive studies monitor for toxic chemicals. In addition, major municipal and industrial dischargers must monitor for toxicity in their effluents as a condition of their Missouri State Operating Permit.

4. Biological Monitoring Program

A. Objectives: The objectives of this program are to develop numeric criteria describing "reference" aquatic macroinvertebrate and fish communities in Missouri's streams, to implement these criteria within state Water Quality Standards and to continue a statewide fish and aquatic invertebrate monitoring program.

B. Design Methodology: Development of biocriteria for invertebrates and fish involves identification of reference streams in each of Missouri's 17 ecological drainage units. It also includes intensive sampling of invertebrate and fish communities to quantify temporal and spatial variation in reference streams within ecoregions and variation between ecoregions, and the sampling of chemically and physically impaired streams to test sensitivity of various community metrics to differences in stream quality.

C. Number of Sites, Sampling Methods, Sampling Frequency and Parameters: The Department has conducted biological sampling of aquatic invertebrates for many years. Since 1991, this program has consisted of standardized monitoring of approximately 55 sites twice annually. The Missouri Department of Conservation presently has a statewide fish and aquatic invertebrate monitoring program, the Resource Assessment and Monitoring Program, designed to assess and monitor the health of Missouri's stream resources. This program samples a minimum of 450 random and 30 reference sites every five years.

5. Fish Tissue Monitoring Program

A. Objective: Fish tissue monitoring can address two separate objectives. These are: (1) the assessment of ecological health or the health of aquatic biota (usually accomplished by monitoring whole fish samples); and (2) the assessment of human health risk based on the level of contamination of fish fillets or fish eggs.

B. Design Methodology: Fish tissue monitoring sites were chosen based on one of the following criteria:

- Site is believed to have water and sediment quality representative of many neighboring streams or lakes of similar size due to similarity in geology, hydrology and land use, and the absence of any known impact from a significant point source or discrete nonpoint water pollution source.
- Site is downstream of a significant point source or discrete nonpoint source area.
- Site has shown fish tissue contamination in the past.

C. Number of Sites, Sampling Methods, Sampling Frequency and Parameters:

The Department and EPA have a cooperative fish tissue monitoring program that collects whole fish composite samples[3] at approximately 12 fixed sites. Each site is sampled once every two years. The preferred species for these sites are either carp or redhorse sucker.

The Department, EPA and the Missouri Department of Conservation also sample 40 to 50 discretionary sites annually for two fish fillet composite samples. One sample is of a top carnivore such as largemouth bass, smallmouth bass, walleye or sauger. The other sample is for a species of a lower trophic level such as catfish, carp or sucker. This program occasionally samples fish eggs for certain fish species at selected locations. Both of these monitoring programs analyze for several chlorinated hydrocarbon insecticides, PCBs, lead, cadmium, mercury and fat content.

6. Volunteer Monitoring Program

Two major volunteer monitoring programs are now generating water quality data in Missouri. The first is the Lakes of Missouri Volunteer Program. This cooperative program consists of persons from the Department, the University of Missouri-Columbia and volunteers that monitor approximately 50 lakes, including Lake Taneycomo, Table Rock Lake and several lakes in the Kansas City area. Data from this program is used by the university as part of a long-term study on the limnology of midwestern reservoirs.

The second program involves volunteers who monitor water quality of streams throughout Missouri. The Volunteer Water Quality Monitoring Program is a subprogram of the Missouri Stream Team Program, a cooperative project sponsored by the Department, the Missouri Department of Conservation and the Conservation Federation of Missouri. By the end of 2006, almost 3,800 citizen volunteers had attended at least one training workshop. After the introductory class, many proceed on to at least one more class of higher level training: Levels 1, 2, 3 and 4. Each level of training is a prerequisite for the next higher level, as is appropriate data submission. Data generated by Levels 2, 3 and 4 and the new Cooperative Site Investigation Program volunteers represent increasingly higher quality assurance. Of those completing an introductory course, about 40 percent proceed to Levels 1 and 2. Eighty-two volunteers have reached Level 3 and six volunteers have reached Level 4.

[3] A composite sample is one in which several individual fish are combined to produce one sample.

The Cooperative Site Investigation Program uses trained volunteers to collect samples and transport them to laboratories approved by the Department. Volunteers and Department staff work together to develop a monitoring plan. Currently there are 11 volunteers qualified to work in the Cooperative Site Investigation Program.

Laboratory Analytical Support

Laboratories used:

- Department/U.S. Geological Survey Cooperative Fixed Station Network: U.S. Geological Survey Lab, Denver, Colorado
- Department's Public Drinking Water Reservoir Network: Department's Environmental Services Program
- Intensive Surveys: Varies, many are done by the Department's Environmental Services Program
- Toxicity Testing of Effluents: Many commercial laboratories
- Biological Criteria for Aquatic Invertebrates: Department's Environmental Services Program and University of Missouri-Columbia
- Fish Tissue: EPA Region VII Laboratory, Kansas City, Kansas and miscellaneous contract laboratories (Missouri Department of Conservation)
- Missouri State Operating Permit: Self-monitoring or commercial laboratories
- Department's Public Drinking Water Monitoring: Department's Environmental Services Program and commercial laboratories
- Other water quality studies: Many commercial laboratories

B. Identification of All Existing and Readily Available Water Quality Data Sources:

The following data sources are used by the Department to aid in the compilation of the state's 305(b) Report. Where quality assurance programs are deemed acceptable, these sources would also be used to develop the state's Section 303(d) List. These sources presently include but are not limited to:

1. Fixed station water quality and sediment data collected and analyzed by the Department's Environmental Services Program personnel.
2. Fixed station water quality data collected by the U.S. Geological Survey under contractual agreements with the Department.
3. Fixed station water quality data collected by the U.S. Geological Survey under contractual agreements to agencies or organizations other than the Department.
4. Fixed station water quality, sediment quality and aquatic biological information collected by the U.S. Geological Survey under their National Stream Quality Accounting Network and the National Water Quality Assessment Monitoring Programs.

5. Fixed station raw water quality data collected by the Kansas City Water Services Department, the St. Louis City Water Company, the Missouri American Water Company (formerly St. Louis County Water Company), Springfield City Utilities and Springfield's Department of Public Works.
6. Fixed station water quality data collected by the U.S. Army Corps of Engineers. The Kansas City, St. Louis and Little Rock Corps Districts have monitoring programs for Corps-operated reservoirs in Missouri.
7. Fixed station water quality data collected by the Arkansas Department of Environmental Quality, the Kansas Department of Health and Environment, the Iowa Department of Natural Resources, and the Illinois Environmental Protection Agency.
8. Fixed station water quality monitoring by corporations**.**
9. Annual fish tissue monitoring programs by the Environmental Protection Agency/Department Regional Ambient Fish Tissue Monitoring Program and the Missouri Department of Conservation.
10. Special water quality surveys conducted by the Department. Most of these surveys are focused on the water quality impacts of specific point source wastewater discharges. Some surveys are of well-delimited nonpoint sources such as abandoned mined lands. These surveys often include physical habitat evaluation and monitoring of aquatic invertebrates as well as water chemistry monitoring.
11. Special water quality surveys conducted by U.S. Geological Survey, including but not limited to:
    a) Geology, hydrology and water quality of various hazardous waste sites,
    b) Geology, hydrology and water quality of various abandoned mining areas,
    c) Hydrology and water quality of urban nonpoint source runoff in St. Louis, Kansas City and Springfield, Missouri, and
    d) Bacterial and nutrient contamination of streams in southern Missouri.
12. Special water quality studies by other agencies such as the Missouri Department of Conservation, the U.S. Public Health Service, and the Missouri Department of Health and Senior Services.
13. Monitoring of fish occurrence and distribution by the Missouri Department of Conservation.
14. Fish Kill and Water Pollution Investigations Reports published by the Missouri Department of Conservation.
15. Selected graduate research projects pertaining to water quality and/or aquatic biology.
16. Water quality, sediment and aquatic biological data collected by the Department, the Environmental Protection Agency or their contractors at hazardous waste sites in Missouri.
17. Self-monitoring of receiving streams by cities, sewer districts and industries, or contractors on their behalf, for those discharges that require this kind of monitoring. This monitoring includes chemical and sometimes toxicity monitoring of some of the

larger wastewater discharges, particularly those that discharge to smaller streams and have the greatest potential to affect instream water quality.

18. Compliance monitoring of receiving waters by the Department and EPA. This can include chemical and toxicity monitoring.
19. Bacterial monitoring of streams and lakes by county health departments, community lake associations and other organizations using acceptable analytical methods.
20. Other monitoring activities done under a quality assurance project plan approved by the Department.
21. Fixed station water quality and aquatic invertebrate monitoring by volunteers who have successfully completed the Volunteer Water Quality Monitoring Program Level 2 workshop. Data collected by volunteers who have successfully completed a training Level 2 workshop is considered to be Data Code One. Data generated from Volunteer Training Levels 2, 3 and 4 are considered "screening" level data and can be useful in providing an indication of a water quality problem. For this reason, the data is eligible for use in distinguishing between waters in Categories 2A and 2B or Categories 3A and 3B. Most of this data is not used to place waters in main Categories (1, 2, 3, 4 and 5) because analytical procedures do not use EPA or Standard Methods approved methods. Data from volunteers who have not yet completed a Level 2 training workshop do not have sufficient quality assurance to be used for any assessment purposes. Data generated by volunteers while participating in the Department's Cooperative Site Investigation Program (Section II C1) or other volunteer data that otherwise meets the quality assurance outlined in Section II C2 can be used in the Section 303(d) assessment process.

The following data sources (22-25) cannot be used rate a water as impaired (Categories 4A, 4B, 4C or 5); however, these data sources may be used to direct additional monitoring that would allow a water quality assessment for Section 303(d) listing purposes.

22. Fish Management Basin Plans published by the Missouri Department of Conservation.
23. Fish Consumption Advisories published annually by the Missouri Department of Health and Senior Services. Note: the department may use data from date source No. 9 to list individual waters as impaired due to contaminated fish tissue.
24. Self-monitoring of wastewater by cities, sewer districts and industries, or contractors on their behalf, that have significant wastewater discharges. This monitoring includes chemical and sometimes toxicity monitoring of some of the larger wastewater discharges, particularly those that discharge to smaller streams and have the greatest potential to effect instream water quality.
25. Compliance monitoring of wastewater by the Department and the Environmental Protection Agency. This can include chemical and toxicity monitoring.

The Department will review all data of acceptable quality that is submitted to the Department prior to the end of the first public notice of the draft 303(d) list. The Department reserves the right to review and use data of acceptable quality submitted after this date if the data results in a change to the assessment status of the water.

C. Data Quality Considerations

1. DNR Quality Assurance/Quality Control Program

   The Department and EPA Region VII have completed a Total Quality Management Plan. All environmental data generated directly by the Department, or through contracts funded by the Department, or EPA require a Quality Assurance Project Plan. The agency or organization responsible for collection and/or analysis of the environmental sampling must write and adhere to a Quality Assurance Project Plan approved through the Department's Total Quality Management Plan. Any environmental data generated by a monitoring plan with a Department approved Quality Assurance Project Plan is considered suitable for use in the 303(d) assessment process. This includes data generated by volunteers participating in the department's Cooperative Site Investigation Program. Under this program, the Department's Environmental Services Program will audit selected non-profit (governmental and university) laboratories. Laboratories that pass this audit will be approved for the Cooperative Site Investigation Program. Individual volunteers that collect samples and deliver them to an approved laboratory must first successfully complete Department training in proper collection and handling of samples. The kind of information that should allow the department to make a judgment on the acceptability of a quality assurance program are: (1) a description of the training, and work experience of the persons involved in the program, (2) a description of the field meters used and maintenance and calibration procedures used, (3) a description of sample collection and handling procedures and (4) a description of all analytical methods used for samples taken to a laboratory for analysis.

2. Other Quality Assurance/Quality Control Programs

   Data generated in the absence of a Department-approved Quality Assurance Project Plan may be used to determine the 303(d) status of a water if the Department determines that the data is scientifically defensible after making a review of the quality assurance procedures used by the data generator. This review would include: (1) names of all persons involved in the monitoring program, their duties and a description of training and work related experience, (2) all written procedures, Standard Operating Procedures, or Quality Assurance Project Plans pertaining to this monitoring effort, (3) a description of all field methods used, brand names and model numbers of any equipment and a description of calibration and maintenance procedures, and (4) a description of laboratory analytical methods. This review may also include an audit by the Department's Environmental Services Program.

3. Other Data Quality Considerations

3.1 Data Age. For assessing present conditions, more recent data is preferable; however, older data can be used to assess present conditions if the data remains representative of present conditions.

If the department uses data to make a 303(d) List decision that predates the date the list is initially developed by more than seven years, the Department will provide a written justification for the use of such data.

A second consideration is the age of the data relative to significant events that may have an effect on water quality. Data collected prior to the initiation, closure or significant change in a wastewater discharge, or prior to a large spill event or the reclamation of a mining or hazardous waste site, for example, may not be representative of present conditions. Such data would not be used to assess present conditions even if it was less than seven years old. Such "pre-event" data can be used to determine changes in water quality before and after the event or to show water quality time trends.

3.2 Data Type, Amount and Information Content. EPA recommends establishing a series of data codes, and rating data quality by the kind and amount of data present at a particular location (EPA 1997[4]). The codes are single digit numbers from one to four, indicating the relative degree of assurance the user has in the value of a particular environmental data set. Data Code One indicates the least assurance or the least number of samples or analytes and Data Code Four the greatest. Based on EPA's guidance, the Department uses the following rules to assign code numbers to data.

Data Code[5] One: All data not meeting the requirements of Data Code Two, Three or Four.

Data Code Two: Chemical data collected quarterly to bimonthly for at least three years or intensive studies that monitor several nearby sites repeatedly over short periods of time or at least three fish tissue samples per water body.

Data Code Three: Chemical data collected at least monthly for more than three years on a variety of water quality constituents including heavy metals and pesticides; or quantitative biological monitoring of at least one aquatic assemblage (fish, invertebrates or algae) at multiple sites, or multiple samples at a single site when data from that site is supported by biological monitoring at an appropriate control site.

Data Code Four: Chemical data collected at least monthly for more than three years that provides data on a variety of water quality constituents including heavy metals and pesticides, and including chemical sampling of sediments and fish tissue; or quantitative biological monitoring of at least two aquatic assemblages (fish, invertebrates or algae) at multiple sites.

[4] *Guidelines for the Preparation of the Comprehensive State Water Quality Assessments (305b) and Electronic Updates*, 1997.
[5] Data Code One is equivalent to data water quality assurance Level One in 10 CSR 20-7.050 General Methodology for Development of Impaired Waters List, subsection (2)(C), Data Code Two is equivalent to Level 2, etc.

In Missouri, the primary purpose of Data Code One data is to provide a rapid and inexpensive method of screening large numbers of waters for obvious water quality problems and to determine where more intensive monitoring is needed. In the preparation of the state's 305(b) Report, data from all four data quality levels are used. Most of the data is of Data Code One quality, and without Data Code One data, the Department would not be able to assess a majority of the state's waters.

In general, when selecting water bodies for the Missouri 303(d) List, only Data Code Two or higher data are used, unless the problem can be accurately characterized by Data Code One data.[6] The reason is that Data Code Two data provides a higher level of assurance that a Water Quality Standard is actually being exceeded and that a Total Maximum Daily Load study is necessary. All water bodies placed in Categories 2B or 3B receive high priority for additional monitoring so that data quality is upgraded to at least Data Code Two.

D. How Water Quality Data is Evaluated to Determine Whether or Not Waters are Impaired for 303(d) Listing Purposes

Physical, Chemical, Biological and Toxicity Data

Each reporting cycle, the Department and stakeholders review and revise the guidelines for determining water quality impairment. These guidelines are shown in Tables 1.1 and 1.2 which provide the general rules of data use and assessment and Tables B-1 and B-2 that provide details about the specific analytical procedure used. In addition, if time trend data indicates that presently unimpaired waters will become impaired prior to the next listing cycle, these "threatened waters" will be judged to be impaired. Where antidegradation provisions in Missouri's Water Quality Standards apply, those provisions shall be upheld. The numeric criteria included in Table 1.1 have been adopted into the state Water Quality Standards, 10 CSR 20-7.031, and are used, as described in Table 1.1, to make use attainment decisions. For narrative criteria, the numeric thresholds included in Table 1.2 have not been adopted into state Water Quality Standards. The Department will use a weight of evidence analysis for all narrative criteria. For those analytes with numeric thresholds, the threshold values given in Table 1.2 will trigger a weight of evidence analysis to determine the existence or likelihood of use impairment and the appropriateness of proposing a listing based on narrative criteria. This weight of evidence analysis will include the use of other types of environmental data when it is available. Examples of other relevant environmental data might include biological data on fish or aquatic invertebrate animals or toxicity testing of water or sediments. When the weight of evidence analysis suggests, but does not provide strong, scientifically defensible evidence of impairment, the Department will place the water body in question in Categories 2B or 3B. The Department will produce a document showing all relevant data and the rationale for

[6] When a listing, amendment or delisting of a 303(d) water is made with only Data Code One data, a document will be prepared that includes a display of all data and a presentation of all statistical tests or other evaluative techniques that documents the scientific defensibility of the data. This requirement applies to all Data Code One data identified in Table 1 of this document.

the use attainment decision. All such documents will be made available to the public at the time of the first public notice of the proposed 303(d) list. A final recommendation on the listing of a water based on narrative criteria will only be made after full consideration of all comments on the proposal.

For the interpretation of biological data, where habitat assessment data indicates habitat scores are less than 75 percent of reference or appropriate control stream scores, and in the absence of other data indicating impairment by a discrete pollutant, a waterbody judged to be impaired will be placed in Category 4C.

For the interpretation of toxicity test data, standard acute or chronic bioassay procedures using freshwater aquatic fauna such as, but not limited to, *Ceriodaphnia dubia, Pimephales promelas* or *Hyalella azteca* will provide adequate evidence of toxicity for 303(d) listing purposes. Microtox toxicity tests may be used to list a water as affected by "toxicity" only if there is data of another kind (freshwater toxicity tests, sediment chemistry, water chemistry or biological sampling) that indicates water quality impairment.

TABLE 1.1 METHODS FOR ASSESSING COMPLIANCE WITH WATER QUALITY STANDARDS USED FOR 303(d) LISTING PURPOSES: NUMERIC CRITERIA THAT ARE INCLUDED IN STATE WATER QUALITY STANDARDS, 10 CSR 20-7.031

BENEFICIAL USES	**DATA TYPE**	**DATA QUALITY CODE**	**COMPLIANCE WITH WATER QUALITY STANDARDS**[7]
Overall use protection (all beneficial uses)	No data. Evaluated based on similar land use/ geology as stream with water quality data.[8]	Not applicable	Given same rating as monitored stream with same land use and geology.
Any beneficial uses	No data available or where only effluent data is available. Results of dilution calculations or water quality modeling. (see ALRR p.38)	Not applicable	Where models or other dilution calculations indicate noncompliance with allowable pollutant levels and frequencies noted in this table, waters may be added to Category 3B and considered high priority for water quality monitoring.
Protection of Aquatic Life Protection of Groundwaters	Water temperature, pH, total dissolved gases, oil and grease. E. coli bacteria	1-4	Full: No more than 10% of all samples exceed criterion.[9] Non-Attainment: Requirements for full attainment not met. The criterion for E. coli is 126 counts/100ml. 10 CSR 20-7.031 (4)(C)

[7] See section on Statistical Considerations, Table B-1 and B-2.
[8] This data type is used only for wide-scale assessments of aquatic biota and aquatic habitat for 305(b) Report purposes. This data type is not used in the development of the 303(d) List.
[9] Some sampling periods are wholly or predominantly during the critical period of the year when criteria violations occur. Where the monitoring program presents good evidence of a demarcation between seasons where criteria exceedences occur and seasons when they do not, the 10% exceedence rate will be based on an annual estimate of the frequency of exceedence.

TABLE 1.1 METHODS FOR ASSESSING COMPLIANCE WITH WATER QUALITY STANDARDS USED FOR 303(d) LISTING PURPOSES: NUMERIC CRITERIA THAT ARE INCLUDED IN STATE WATER QUALITY STANDARDS, 10 CSR 20-7.031

BENEFICIAL USES	DATA TYPE	DATA QUALITY CODE	COMPLIANCE WITH WATER QUALITY STANDARDS[7]
Protection of Aquatic Life	Dissolved oxygen.	1-4	Full: No more than 10% of all samples exceed criterion.[9] Non-Attainment: Requirements for full attainment not met.
Protection of Aquatic Life	Toxic Chemicals	1-4	Full: No more than one acute toxic event in three years. No more than one exceedence of acute or chronic criterion in the last three years for which data is available. Non-Attainment: Requirements for full attainment not met.
Protection of Aquatic Life	Nutrients in Lakes (total phosphorus, Total nitrogen, Chlorophyll)	1-4	Full: Nutrient levels do not exceed WATER QUALITY STANDARDS. Non-Attainment: Requirements for full attainment not met.[10]
Fish Consumption	Chemicals (water)	1-4	Full: Water quality does not exceed WATER QUALITY STANDARDS Non-Attainment: Requirements for full attainment not met.
Drinking Water Supply -Raw Water.[11]	Chemical (toxics)	1-4	Full: WATER QUALITY STANDARDS not exceeded Non-Attainment: Requirements for full attainment not met.
Drinking Water Supply- Raw Water	Chemical (sulfate, chloride, fluoride)	1-4	Full: WATER QUALITY STANDARDS not exceeded . Non-Attainment: Requirements for full attainment not met.
Drinking Water Supply-Finished Water	Chemical (toxics)	1-4	Full: No MCL* violations based on Safe Drinking Water Act data evaluation procedures. Non-Attainment: Requirements for full attainment not met. NOTE: Finished water data will not be used for analytes where water quality problems may be caused by the drinking water treatment process such as the formation of Trihalomethanes (THMs) or problems that may be caused by the distribution system (bacteria, lead, copper).
Whole-Body-Contact Recreation and Secondary Contact	Fecal Coliform or *E. coli* count	1-4	Where there are at least five samples per year taken during the recreational season: Full: WATER QUALITY STANDARDS not exceeded as a geometric mean, in any of the last three years for which data is available, for samples

[10] Nutrient criteria will be used in the 2014 LMD only if these criteria appear in the Code of State Regulations, and have not been disapproved by the U.S. Environmental Protection Agency.
[11] Raw water is water from a stream, lake or ground water prior to treatment in a drinking water treatment plant.

TABLE 1.1 METHODS FOR ASSESSING COMPLIANCE WITH WATER QUALITY STANDARDS USED FOR 303(d) LISTING PURPOSES: NUMERIC CRITERIA THAT ARE INCLUDED IN STATE WATER QUALITY STANDARDS, 10 CSR 20-7.031

BENEFICIAL USES	DATA TYPE	DATA QUALITY CODE	COMPLIANCE WITH WATER QUALITY STANDARDS[7]
Recreation			collected during seasons for which bacteria criteria apply.[12] Non-Attainment: Requirements for full attainment not met.
Irrigation, Livestock and Wildlife Water	Chemical	1-4	Full: WATER QUALITY STANDARDS not exceeded. Non-Attainment: Requirements for full attainment not met.

*Maximum Contaminant Level

[12] A geometric mean of 206 cfu/100 ml for E. coli will be used as a criterion value for Category B Recreational Waters. Because Missouri's Fecal Coliform Standard ended December 31, 2008, any waters appearing on the 2008 303(d) List as a result of the Fecal Coliform Standard will be retained on the list with the pollutant listed as "bacteria" until sufficient E. coli sampling has determined the status of the water.

TABLE 1.2 METHODS FOR ASSESSING COMPLIANCE WITH WATER QUALITY STANDARDS USED FOR 303(d) LISTING PURPOSES: NARRATIVE CRITERIA BASED ON NUMERIC THRESHOLDS NOT CONTAINED IN STATE WATER QUALITY STANDARDS (10 CSR 20-7.031)

BENEFICIAL USES	DATA TYPE	DATA QUALITY CODE	COMPLIANCE WITH WATER QUALITY STANDARDS[7]
Overall use protection (all beneficial uses)	Narrative criteria for which quantifiable measurements can be made.	1-4	Full: Stream appearance typical of reference or appropriate control streams in this region of the state. Non-Attainment: The weight of evidence, based on the narrative criteria in 10 CSR 20-7.031(3), demonstrates the observed condition exceed a numeric threshold necessary for the attainment of a beneficial use For example: Color: Color as measured by the Platinum-Cobalt visual method (SM 2120 B) in a water is statistically significantly higher than a control water. Objectionable Bottom Deposits: The bottom that is covered by sewage sludge, trash or other materials reaching the water due to anthropogenic sources exceeds the amount in reference or control streams by more than twenty percent. Note: Waters in mixing zones and unclassified waters which support aquatic life on an intermittent basis shall be subject to acute toxicity criteria for protection of aquatic life. Waters in the initial Zone of Dilution (ZID) shall not be subject to acute toxicity criteria.
Protection of Aquatic Life	Toxic Chemicals	1-4	Full: No more than one acute toxic event in three years. No more than one exceedence of acute or chronic criterion in three years for all toxics.[13] [14] Non-Attainment: Requirements for full attainment not met.

[13] The test result must be representative of water quality for the entire time period for which acute or chronic criteria apply. For ammonia the chronic exposure period is 30 days, for all other toxics 96 hours. The acute exposure period for all toxics is 24 hours, except for ammonia which has a one hour exposure period. The Department will review all appropriate data, including hydrographic data, to insure only representative data is used. Except on large rivers where storm water flows may persist at relatively unvarying levels for several days, grab samples collected during storm water flows will not be used for assessing chronic toxicity criteria.

[14] In the case of toxic chemicals occurring in benthic sediment rather than in water, the numeric thresholds used to determine the need for further evaluation will be the Probable Effect Concentrations proposed in "Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems" by McDonald, D.D. et al. Arch. Environ. Contam. Toxicol. 39,20-31 (2000). These - Probable Effect Concentrations are as follows: 33 mg/kg As; 4.98 mg/kg Cd; 111 mg/kg Cr; 149 mg/kg Cu; 48.6 mg/kg Ni; 128 mg/kg Pb; 459 mg/kg Zn; 561 µg/kg naphthalene; 1170 µg/kg phenanthrene; 1520 µg/kg pyrene; 1050 µg/kg benzo(a)anthracene, 1290 µg/kg chrysene; 1450 µg/kg benzo(a)pyrene; 22,800 µg/kg total polyaromatic hydrocarbons; 676 µg/kg total PCBs. Chlordane 17.6 ug/kg; Sum DDE 31.3 ug/kg; Lindane (gamma-BHC) 4.99 ug/kg. Where multiple sediment contaminants exist, the Probable Effect Concentrations Quotient shall not exceed 0.75. See Table B-1 and Appendix D for more information on the Probable Effect Concentrations Quotient.

Protection of Aquatic Life	Biological: Aq.. Invertebrates- DNR Protocol.	3-4	Full: For seven or fewer samples and following DNR wadeable streams macroinvertebrate sampling and evaluation protocols, 75% of the stream condition index scores must be 16 or greater. Fauna achieving these scores are considered to be very similar to regional reference streams. For greater than seven samples or for other sampling and evaluation protocols, results must be statistically similar to representative reference or control stream[15] Non-Attainment: For seven or fewer samples and following DNR wadeable streams macroinvertebrate sampling and evaluation protocols, 75% of the stream condition index scores must be 14 or lower. Fauna achieving these scores are considered to be substantially different from regional reference streams. For more than seven samples or for other sampling and evaluation protocols, results must be statistically dissimilar to control or representative reference streams.
	Biological: MDC Fish Community (RAM) Protocol (Ozark Plateau only)	3-4	Full : IBI [16] Score >36, Inconclusive: For first and second order streams IBI score of 29-36. Suspected of Impairment: data not conclusive (Category 2B). For first and second order streams IBI score < 29. For third to fifth order stream , IBI score 29-36. Non-Attainment: For third to fifth order streams, IBI score < 29.
	Other Biological Data	3-4	Full: Results must be statistically similar to representative reference or control streams.[15] Non-Attainment: Results must be statistically dissimilar to control or representative reference streams. .

[15] See Table B-1 and B-2. For test streams that are significantly smaller than bioreference streams where both bioreference streams and small control streams are used to assess the biological integrity of the test stream, the assessment of the data should display and take into account both types of control streams.
[16] IBI scores are from "Biological Criteria for Stream Fish Communities in Missouri" 2008. Doisy, et al. for MDC.

Protection of Aquatic Life	Toxicity testing of streams or lakes using aquatic organisms	2	Full: No more than one test result of statistically significant deviation from controls in acute or chronic test in a three-year period.[15] Non-Attainment: Requirements for full attainment not met.
Fish Consumption	Chemicals (tissue)	1-2	Full: Fish tissue levels in fillets and eggs do not exceed guidelines.[17] Non-Attainment: Requirements for full attainment not met.

Duration of Assessment Period

Except where the assessment period is specifically noted in Table 1, the time period for which data will be used in making the assessments noted in Table 1 will be determined by the data age considerations in Section II.C.3.3.1 and data representativeness considerations in Table 1 footnote 13.

Assessment of Tier Three Waters

Waters given Tier Three protection by the antidegradation rule at 10 CSR 20-7.031(2), shall be considered impaired if water quality data indicate a reduction in the waters' historical quality. Historical quality is determined from past data that best describes the waters' quality following promulgation of the antidegradation rule and at the time the water was given Tier Three protection.

Historical data gathered at the time the waters were given Tier Three protection will be used if available. Because historical data may be limited, the historical quality of the waters may be determined by comparing data from the assessed segment with data from a "representative" segment. A representative segment is a body or stretch of water that best reflects the conditions that probably existed at the time the antidegradation rule first applied to the waters being assessed. Examples of possible representative data include 1) data from segments upstream from assessed segments that receive discharges of the quality and quantity that mimic the historical discharges to the assessed segment, and 2) data from other bodies of water in the same ecoregion having a similar watershed and landscape and receiving discharges and runoff of the quality and quantity that mimic the historical discharges to the assessed segment. The assessment may also use data from the assessed segment gathered between the time of the initiation of Tier Three protection and the last known point in time in which upstream discharges, runoff and watershed

[17] Fish tissue threshold levels are; chlordane 0.1 mg/kg (Crellin, J.R. 1989, *"New Trigger Levels for Chlordane in Fish-Revised Memo"* Mo. Dept. of Health inter-office memorandum. June 16, 1989); mercury 0.3 mg/kg based on "Water Quality Criterion for Protection of Human Health: Methylmercury" EPA-823-R-01-001. Jan. 2001. http://www.epa.gov/waterscience/criteria/methylmercury/merctitl.pdf; PCBs 0.75 mg/kg, MDHSS Memorandum August 30, 2006 "*Development of PCB Risk-based Fish Consumption Limit Tables*"; and lead 0.3- mg/kg (World Health Organization 1972. *"Evaluation of Certain Food Additives and the Contaminants Mercury, Lead and Cadmium"*. WHO Technical Report Series No. 505, Sixteenth Report on the Joint FAO/WHO Expert Committee on Food Additives. Geneva 33 pp. Assessment of Mercury will be based on samples solely from the following higher trophic level fish species; walleye, sauger, trout, black bass, white bass, striped bass, northern pike, flathead catfish and blue catfish.

conditions remained the same may if the data do not show any significant trends of declining water quality during that period.

The data used in the comparisons will be tested for normality and an appropriate statistical test will be applied. The null hypothesis for the test will be that assessed segment and the representative segment have the same water quality. This will be a one-tailed test (the test will consider only the possibility that the assessed segment has poorer water quality) with the alpha level of 0.1, meaning that the test must show greater than a 90 percent probability that the assessed segment has poorer water quality than the representative segment before the assessed segment can be listed as impaired.

Other Types of Information

1. Observation and evaluation of waters for noncompliance with state narrative water quality criteria. Missouri's narrative water quality criteria, as described in 10 CSR 20-7.031 Section (3), may be used to evaluate waters when a quantitative value can be applied to the pollutant (see Table 1 page 15). These narrative criteria apply to both classified and unclassified waters and prohibit the following in waters of the state:
    a. Unsightly, putrescent or harmful bottom deposits,
    b. Oil, scum and floating debris,
    c. Unsightly color, turbidity or odor,
    d. Substances or conditions causing toxicity to human, animal or aquatic life,
    e. Human health hazard due to incidental contact,
    f. Acute toxicity to livestock or wildlife when used as a drinking water supply,
    g. Physical, chemical or hydrologic changes that impair the natural biological community, and
    h. Used tires, car bodies, appliances, demolition debris, used vehicles or equipment and any solid waste as defined by Missouri's Solid Waste Law,
    i. Acute toxicity.
2. Habitat assessment protocols for wadeable streams have been established and are made in conjunction with sampling of aquatic invertebrates and the analysis of aquatic invertebrates data. The Department will not use habitat assessment data alone for assessment purposes.

E. Other 303(d) Listing Considerations

1. Adding to the Existing List or Expanding the Scope of Impairment to a Previously Listed Water

    The listed portion of an impaired water may be increased based on recent monitoring data following the guidelines in this document. One or more new pollutants may be added to the listing for a water already on the list based on recent monitoring data following these

same guidelines. Waters not previously listed may be added to the list following the guidelines in this document.

2. Deleting from the Existing List or Decreasing the Scope of Impairment to a Previously Listed Water

The listed portion of an impaired water may be decreased based on recent monitoring data following the guidelines in this document. One or more pollutants may be deleted from the listing for a water already on the list based on recent monitoring data following these same guidelines. Waters may be completely removed from the list for several reasons[18], the most common being (1) water has returned to compliance with water quality standards or (2) the water has an approved Total Maximum Daily Load study.

3. Prioritization of Waters for Total Maximum Daily Load Development

Section 303(d) of the Clean Water Act and federal regulation 40 CFR 130.7(b)(4) require states to submit a priority ranking of waters still requiring Total Maximum Daily Loads. The department will prioritize development of Total Maximum Daily Loads based on several variables including:

- severity of the water quality problem
- amount of time necessary to acquire sufficient data to develop the Total Maximum Daily Load
- court orders, consent decrees or other formal agreements
- budgetary constraints, and
- amenability of the problem to treatment

The department's Total Maximum Daily Load schedule will represent its prioritization.

4. Resolution of Interstate/International Disagreements

The Department will review the draft 303(d) Lists of all other states with which it shares a border (Missouri River, Mississippi River, Des Moines River and the St. Francis River) or other interstate waters. Where the listing in another state is different than in Missouri, the department will request the data upon which the listing in the other state is based. This data will be reviewed following all data evaluation guidelines previously discussed in this document. The Missouri list may be changed pending the evaluation of this additional data.

[18] see, "Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act". USEPA, Office of Water, Washington DC.

Appendix A

Excerpt from *Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act.* July 29, 2005. USEPA pp.39-41.

G. How should statistical approaches be used in attainment determinations?

The state's methodology should provide a rationale for any statistical interpretation of data for the purpose of making an assessment determination.

1. Description of statistical methods to be employed in various circumstances:

The methodology should provide a clear explanation of which analytic tools the state uses and under which circumstances. EPA recommends that the methodology explain issues such as the selection of key sample statistics (arithmetic mean concentration, median concentration, or a percentile), null and alternative hypotheses, confidence intervals, and Type I and Type II error thresholds. The choice of a statistic tool should be based on the known or expected distribution of the concentration of a pollutant in the segment (e.g., normal or log normal) in both time and space.

Past EPA guidance, 1997 305(b) and 2000 CALM, recommended making non-attainment decisions for "conventional pollutants" – Total Suspended Solids, pH, Biochemical Oxygen Demand, fecal coliform bacteria and oil and grease – when more than 10% of measurements exceed the water quality criterion; however, EPA guidance has not encouraged use of the 10% rule with other pollutants, including toxics. Use of this rule when addressing conventional pollutants, is appropriate if its application is consistent with the manner in which the applicable water quality criterion are expressed. An example of a water quality criterion for which an assessment based on the 10% rule would be appropriate is the EPA acute water quality criterion for fecal coliform bacteria, applicable to protection of water contact recreational use. This 1976-issued water quality criterion was expressed as, "...no more than ten percent of the samples exceeding 400 CFU per 100ml, during a 30-day period. This assessment methodology is clearly reflective of the water quality criterion.

On the other hand, use of the 10 percent rule for interpreting water quality data is usually not consistent with water quality criterion expressed either as: (1) instantaneous maxima not to be surpassed at any time; or (2) average concentrations over specified times. In the case of "instantaneous maxima (or minima) never to occur" criteria use of the 10 percent rule typically leads to the belief that segment conditions are equal to or better than specified by the water quality criterion, when they in fact are considerably worse. (That is, pollutant concentrations are above the criterion concentration a far greater proportion of the time than specified by the water quality criterion). Conversely, use of this decision rule in concert with water quality criterion expressed as average concentrations over specific times can lead to

concluding that segment conditions are worse than water quality criterion, when in fact, they are not. If the state applies different decision rules for different types of pollutants (e.g., toxic, conventional, and non-conventional pollutants) and types of standards (e.g., acute versus chronic criteria for aquatic life or human health), the state should provide a reasonable rationale supporting the choice of a particular statistical approach to each of its different sets of pollutants and types of standards.

2. Elucidation of policy choices embedded in selection of particular statistical approaches and use of certain assumptions:

   EPA strongly encourages states to highlight policy decisions implicit in the statistical analysis that they have chosen to employ in various circumstances. For example, if hypothesis testing is used, the state should make its decision-making rules transparent by explaining why it chose either "meeting Water Quality Standards" or "not meeting Water Quality Standards" as the null hypothesis (refutable presumption) as a general rule for all waters, a category of waters, or an individual segment. Starting with the assumption that a water is "healthy" when employing hypothesis testing means that a segment will be identified as impaired, and placed in Category 4 or 5, only if substantial amounts of credible evidence exist to refute the presumption. By contrast, making the null hypothesis "Water Quality Standards not being met" shifts the burden of proof to those who believe the segment is, in fact, meeting Water Quality Standards.

   Which "null hypothesis" a state selects could likely create contrasting incentives regarding support for additional ambient monitoring among different stakeholders. If the null hypothesis is "meeting standards", there was no previous data on the segment, and no additional existing and readily available data and information is collected, then the "null hypothesis" cannot be rejected, and the segment would not be placed in Category 4 or 5. In this situation, those concerned about possible adverse consequences of having a segment declared "impaired" might have little interest in collection of additional ambient data. Meanwhile, users of the segment would likely want to have the segment monitored, so they can be assured that it is indeed capable of supporting the uses of concern. On the other hand, if the null hypothesis is changed to "segment not meeting Water Quality Standards": then those that would prefer that a particular segment not be labeled "impaired" would probably want more data collected, in hopes of proving that the null hypothesis is not true.

   Another key policy issue in hypothesis testing is what significance level to use in deciding whether to reject the null hypothesis. Picking a high level of significance for rejecting the null hypothesis means that great emphasis is being placed on avoiding a Type I error (rejecting the null hypothesis, when in fact, the null hypothesis is true). This means that if a 0.10 significance level is chosen, the state wants to keep the chance of making a Type I error at or below 10 percent. Hence, if the chosen null hypothesis is "segment meeting Water Quality Standards", the state is trying to keep the chance of saying a segment is impaired, when in reality it is not, under 10 percent.

An additional policy issue is the Type II errors (not rejecting the null hypothesis, when it should have been). The probability of Type II errors depends on several factors. One key factor is the number of samples available. With a fixed number of samples, as the probability of Type I error decreases, the probability of a Type II error increases. States would ideally collect enough samples so the chances of making Type I and Type II errors are simultaneously small. Unfortunately, resources needed to collect those numbers of samples are quite often not available.

The final example of a policy issue that a state should describe is the rationale for concentrating limited resources to support data collection and statistical analysis in segments where there are documented water quality problems or where the combination of nonpoint source loadings and point source discharges would indicate a strong potential for a water quality problem to exist.

EPA recommends that, when picking the decision rules and statistical methods to be utilized when interpreting data and information, states attempt to minimize the chances of making either of the following two errors:

- Concluding the segment is impaired, when in fact it is not, and
- Deciding not to declare a segment impaired, when it is in fact impaired.

States should specify in their methodology what significance level they have chosen to use, in various circumstances. The methodology would best describe in "plain English" the likelihood of deciding to list a segment that in reality is not impaired (Type I error if the null hypothesis is "segment not impaired"). Also, EPA encourages states to estimate, in their assessment databases, the probability of making a Type II error (not putting on the 303(d) List a segment that in fact fails to meet Water Quality Standards), when: (1) commonly-available numbers of grab samples are available, and (2) the degree of variance in pollutant concentrations are at commonly encountered levels. For example, if an assessment is being performed with a WQC expressed as a 30-day average concentration of a certain pollutant, it would be useful to estimate the probability of a Type II error when the number of available samples over a 30-day period is equal to the average number of samples for that pollutant in segments statewide, or in a given group of segments, assuming a degree of variance in levels of the pollutant often observed over typical 30-day periods.

Appendix B
Statistical Considerations

The most recent EPA guidance on the use of statistics in the 303(d) listing methodology document is given in Appendix A. Within this guidance there are three major recommendations regarding statistics:

- Provide a description of which analytical tools the state uses under various circumstances,
- When conducting hypothesis testing, explain the various circumstances under which the burden of proof is placed on proving the water is impaired and when it is placed on proving the water is unimpaired, and
- Explain the level of statistical significance used under various circumstances.

Description of Analytical Tools

The Tables B-1 and B-2 below describes the analytical tools the department will use to determine impairment (Table B-1) and to determine when listed waters are no longer impaired (Table B-2).

Table B-1. Description of Analytical Tools for Determining if Waters are Impaired

Beneficial Use	Analytes	Analytical Tool	Decision Rule/ Hypothesis	Criterion Used with the Decision Rule [19]	Significance Level
Narrative Criteria	Color (Narrative)	Hypothesis Test Two Sample, one tailed "t "Test	Null Hypothesis: There is no difference in color between test stream and control stream.	Reject Null Hypothesis if calculated "t" value exceeds tabular "t" value for test alpha	0.10
	Bottom Deposits (Narrative)	Hypothesis Test, One Sided Confidence Limit	Null Hypothesis: Solids of anthropogenic origin cover less than 20% of stream bottom where velocity is less than 0.5 feet/second.	Reject Null Hypothesis if 60% Lower Confidence Limit (LCL) of mean percent fine sediment deposition (pfsd) in stream is greater than the sum of the pfsd in the control and 20 % more of the stream bottom. i.e., where the pfsd is expressed as a decimal, test stream pfsd > (control stream pfsd)+ (0.20)	0.40

[19] Where hypothesis testing is used for media other than fish tissue, for data sets with five samples or fewer, a 75 percent confidence interval around the appropriate central tendencies will be used to determine use attainment status. Use attainment will be determined as follows: (1) If the criterion value is above this interval (all values within the interval are in conformance with the criterion), rate as unimpaired. (2) If the criterion value falls within this interval, rate as unimpaired and place in Category 2B or 3B. (3) If the criterion value is below this interval (all values within the interval are not in conformance with the criterion), rate as impaired. For fish tissue this procedure will be used with the following changes: (1) it will apply only to sample sizes of less than four and, (2) a 50% confidence interval will be used in place of the 75% confidence interval.

Table B-1. Description of Analytical Tools for Determining if Waters are Impaired

Beneficial Use	Analytes	Analytical Tool	Decision Rule/ Hypothesis	Criterion Used with the Decision Rule [19]	Significance Level
Aquatic Life	Biological Monitoring (Narrative)	For DNR Invert protocol: Binomial probability for Sample sizes 8 to 30.	Using DNR Invert. protocol: Null Hypothesis: Frequency of full sustaining scores for test stream is the same as for biological criteria reference streams.	Reject Null Hypothesis if frequency of fully sustaining scores on test stream is significantly less than for biological criteria reference streams.	0.10
		For DNR Invert protocol and sample sizes greater than 30: Direct comparison.	A direct comparison of frequencies between test and biological criteria reference streams will be made	Rate as impaired if biological criteria reference stream frequency of sustain-ing scores is more than five percent more than test stream	Not applicable
		For other biological data: An appropriate parametric or nonparametric test will be used.	Null Hypothesis, Community metric(s) in test stream is the same as for a reference stream or control streams.	Reject Null Hypothesis If metric scores for test stream are significantly less than reference or control streams.	0.1
			Other biological monitoring to be determined by type of data.		
Aquatic Life	Toxic Chemicals in Water. (Numeric)	Not applicable	No more than one toxic event, toxicity test failure or exceedence of acute or chronic criterion in 3 years.	Not applicable	Not applicable
	Toxic Chemicals in Sediments (Narrative)	Comparison of mean to PEL value.	Waters are judged to be Impaired if sample mean Exceeds 150**%** of PEL or 75% of PEQ..[20]		
Aquatic Life	temperature, pH, total diss. gases, oil and grease, diss. oxygen (Numeric)	30 or fewer samples: Binomial probability	Null Hypothesis: No more than 10% of samples exceed the water quality criterion	Reject Null Hypothesis if the exceedence frequency is significantly more than 10%	0.10
		More than 30 samples: Percent of samples that fail to meet criterion.	If observed frequency exceeds 10%, rate as impaired.	Not applicable	Not applicable
Fish Consumption	Toxic Chemicals in water (Numeric)	Hypothesis test 1-Sided Confidence Limit	Null Hypothesis: Levels of contaminants in water do not exceed criterion.	Reject Null Hypothesis if the 60% LCL is greater than the criterion value.	0.40
Fish Consumption	Toxic Chemicals in Tissue (Narrative)	Four or more samples: Hypothesis test 1-Sided Confidence Limit	Null Hypothesis: Levels in fillet samples or fish eggs do not exceed criterion.	Reject Null Hypothesis if the 60% LCL is greater than the criterion value.	0.40

[20] Where there is convincing evidence of a healthy biological community (fish and/or aquatic invertebrate monitoring data) or convincing evidence of a lack of toxicity (two species bioassay tests of sediment elutriate water or sediment pore water), this evidence will be evaluated in conjunction with the sediment PEL data**.**

Table B-1. Description of Analytical Tools for Determining if Waters are Impaired

Beneficial Use	Analytes	Analytical Tool	Decision Rule/ Hypothesis	Criterion Used with the Decision Rule [19]	Significance Level
Drinking Water Supply (Raw)	Toxic Chemicals (Numeric)	Hypothesis test 1-Sided Confidence limit	Null Hypothesis: Levels of contaminants do not exceed criterion.	Reject Null Hypothesis if the 60% LCL is greater than the criterion value.	0.40
Drinking Water Supply (Raw)	Non-toxic Chemicals (Numeric)	Hypothesis test 1-Sided Confidence limit	Null Hypothesis: Levels of contaminants do not exceed criterion.	Reject Null Hypothesis if the 60% LCL is greater than the criterion value.	0.40
Drinking Water Supply (Finished)	Toxic Chemicals	Methods stipulated by Safe Drinking Water Act	Methods stipulated by Safe Drinking Water Act	Methods stipulated by Safe Drinking Water Act	Methods stipulated by Safe Drinking Water Act
Whole Body Contact and Secondary Contact Rec.	Bacteria (Numeric)	Geometric Mean	Null Hypothesis: Levels of contaminants do not exceed criterion.	Reject Null Hypothesis if the Geometric Mean is greater than the criterion value.	-Not Applicable
Irrigation & Livestock Water	Toxic Chemicals (Numeric)	Hypothesis test 1-Sided Confidence limit	Null Hypothesis: Levels of contaminants do not exceed criterion.	Reject Null Hypothesis if the 60% LCL is greater than the criterion value.	0.40
Protection of Aquatic Life	Nutrients in Lakes (Numeric)	Hypothesis test[21]	Null hypothesis: Criteria are not exceeded.	Reject Null hypothesis if 60% LCL value is more than criterion value.	0.40

[21] State nutrient criteria require at least four samples per year taken near the outflow point of the lake (or reservoir) between May 1 and August 31 for at least four different, not necessarily consecutive, years.

Table B-2. Description of Analytical Tools for Determining When Waters are No Longer Impaired

Beneficial Use	Analytes	Analytical Tool	Decision Rule/ Hypothesis	Criterion Used with the Decision Rule [19]	Significance Level
Narrative Criteria	Color (Narrative)	Same as Table B-1	Same as Table B-1	Same as Table B-1	0.40
	Bottom Deposits (Narrative)	Same as Table B-1	Same as Table B-1	Same as Table B-1	0.40
Aquatic Life	Biological Monitoring (Narrative)	DNR Invert Protocol: For 8 to 30 samples Same as Table B-1	Same as Table B-1	Same as Table B-1	0.40
		For DNR Invert Protocol For more than 30 Same as Table B-1	Same as Table B-1.	Same as Table B-1.	Same as Table B-1.
		For other biological data: Same as Table B-1.	Same as Table B-1.	Same as Table B-1.	0.40
	Toxic Chemicals in Water.	Same as Table B-1.	Same as Table B-1.	Same as Table B-1.	Same as Table B-1.
	Toxic Chemicals in Sediments	Comparison of mean to PEL value.	Water is judged to be unimpaired if sample mean does not exceed 150 % of PEL.[22]	Not applicable	Not applicable
Aquatic Life	temperature, pH, total diss. gases, oil and grease, diss. oxygen	30 or fewer samples: Same as Table B-1.	Same as Table B-1.	Same as Table B-1.	Same as Table B-1.
		More than 30 samples: Same as Table B-1.	Same as Table B-1.	Same as Table B-1.	Same as Table B-1.
Fish Consumption	Toxic Chemicals in water	Same as Table B-1.	Same as Table B-1.	Reject null hypothesis if the 60% UCL is greater than the criterion value.	0.40
	Toxic Chemicals in Tissue	Same as Table B-1.	Same as Table B-1.	Reject null hypothesis if the 60% UCL is greater than the criterion value.	0.40
Drinking Water Supply (Raw)	Toxic Chemicals	Same as Table B-1.	Same as Table B-1.	Reject null hypothesis if the 60% UCL is greater than the criterion value.	0.40
Drinking Water Supply (Raw)	Non-toxic Chemicals	Same as Table B-1.	Same as Table B-1.	Reject null hypothesis if the 60% UCL is greater than the criterion value.	0.40
Drinking Water Supply (Finished)	Toxic Chemicals,	Same as Table B-1.	Same as Table B-1.	Same as Table B-1.	Same as Table B-1.
Whole Body Contact and Secondary Contact Rec.	Bacteria	Same as Table B-1.	Same as Table B-1.	Same as Table B-1	Not applicable
Irrigation & Livestock Water	Toxic Chemicals	Same as Table B-1.	Same as Table B-1.	Reject null hypothesis if the 60% UCL is greater than the criterion value.	0.40
Protection of Aquatic Life	Nutrients in Lakes	Same as Table B-1.	Same as Table B-1.	Same as Table B-1.	0.40

[22] Where there is convincing evidence of a healthy biological community (fish and/or aquatic invertebrate monitoring data) or convincing evidence of a lack of toxicity (two species bioassay tests of sediment elutriate water or sediment pore water), sediment PEL data will not be used as the sole justification for listing a water as impaired.

Rationale for the Burden-of-Proof

Hypothesis testing is a common statistical practice. The procedure involves first stating a hypothesis you want to test, such as "the most frequently seen color on clothing at a St. Louis Cardinals game is red" and then the opposite or null hypothesis "red is not the most frequently seen color on clothing at a Cardinals game." Then a statistical test is applied to the data (a sample of the predominant color of clothing worn by 200 fans at a Cardinals game on July 12) and based on an analysis of that data, one of the two hypotheses is chosen as correct.

In hypothesis testing, the burden-of-proof is always on the alternate hypothesis. In other words, there must be very convincing data to make us conclude that the null hypothesis is not true and that we must accept the alternate hypothesis. How convincing the data must be is stated as the "significance level" of the test. A significance level of 0.10 means that there must be at least a 90 percent probability that the alternate hypothesis is true before we can accept it and reject the null hypothesis.

For analysis of a specific kind of data, either the test significance level or the statement of null and alternative hypotheses, or both, can be varied to achieve the desired degree of statistical rigor. The department has chosen to maintain a consistent set of null and alternate hypotheses for all our statistical procedures. The null hypothesis will be that the water body in question is unimpaired and the alternate hypothesis will be that it is impaired. Varying the level of statistical rigor will be accomplished by varying the test significance level. For determining impairment (Table B-1) test significance levels are set at either 0.1 or 0.4, meaning the data must show a 90% or 60% probability respectively, that the water body is impaired. However, if the department retained these same test significance levels in determining when an impaired water had been restored to an unimpaired status (Table B-2) some undesirable results can occur.

For example, using a 0.1 significance level for determining both impairment and nonimpairment; if the sample data indicate the stream had a 92 percent probability of being impaired, it would be rated as impaired. If subsequent data was collected and added to the database and the data now showed the water had an 88 percent chance of being impaired , it would be rated as unimpaired. Judging as unimpaired a water with only a 12 percent probability of being unimpaired is clearly a poor decision. To correct this problem, the department will use a test significance level of 0.4 for some analytes and 0.6 for others. This will increase our confidence in determining compliance with criteria to 40 percent and 60 percent respectively under the worst case conditions, and for most databases will provide an even higher level of confidence.

Level of Significance Used in Tests

The choice of significance levels is largely related to two concerns. The first is concerned with matching error rates with the severity of the consequences of making a decision error. The second addresses the need to balance, to the degree practicable, Type I and Type II error rates.
For relatively small databases, the disparity between Type I and Type II errors can be large. The table below shows error rates calculated using the binomial distribution for two very similar

situations. Type I error rates are based on a stream with a 10 percent exceedence rate of a standard and Type II error rates for a stream with a 15 percent exceedence rate of a standard. Note that choosing a Type I error rate of 0.05 rather than 0.10 increases an already very large Type II error rate by about 10 percent. Also note that for a given Type I error rate, the Type II error rate declines as sample size increases.

Table B-3. Effects of Type I Error Rates and Sample Size on Type II Error Rates

No. of Samples	No. Meeting Standards	Type I Error Rate	Type I Error Rate	No. of Samples	No. Meeting Standards	Type I Error Rate	Type II Error Rate
6	5	.469	.78	4	2	.05	.89
11	9	.302	.78	9	6	.05	.86
18	15	.266	.72	15	11	.05	.82
25	21	.236	.68	21	16	.05	.80
				27	20	.05	.78

Use of the Binomial Probability Distribution for Interpretation of the Ten Percent Rule

There are two options for assessing data for compliance with the ten percent rule. One is to simply calculate the percent of time the criterion value is not met and to judge the water to be impaired if this value is greater than ten percent. The second method is to use some evaluative procedure that can review the data and provide a probability statement regarding the compliance with the ten percent rule. Since the latter option allows assessment decisions relative to specific test significance levels and the first option does not, the latter option is preferred. The procedure chosen is the binomial probability distribution, for data sets up to size 30. Use of the binomial probability is difficult for larger sample sizes. And for these larger data sets impairment will be determined by making direct comparison of percent of samples not compliant with the criterion value with the ten percent guideline.

Other Statistical Considerations

Prior to calculation of confidence limits, the normality of the data set will be evaluated. If normality is improved by a data transformation, the confidence limits will be calculated on the transformed data.

Time of sample collection may be biased and interfere with an accurate measurement of frequency of exceedence of a criterion. Data sets composed mainly or entirely of storm water data or data collected only during a season when water quality problems are expected could result in a biased estimate of the true exceedence frequency. In these cases, the department may use methods to estimate the true annual frequency and display these calculations whenever they result in a change in the impairment status of a water.
For waters judged to be impaired based on biological data where data evaluation procedures are not specifically noted in Table 1, the statistical procedure used, test assumptions and results will be reported.

Appendix C
Examples of Statistical Procedures

Two Sample "t" Test for Color

Null Hypothesis: Amount of color is no greater in test stream than in a control stream. (As stated, this is a one-sided test, meaning that we are only interested in determining whether or not the color level in the test stream is greater than in a control stream.) If the null hypothesis had been "amount of color is different in the test and control streams" we would have been interested in determining if the amount of color was either less than or greater than the control stream, a two-sided test).

Significance Level (also known as the alpha level): 0.10

Data Set: Platinum-Cobalt color units data for the test stream and a control stream samples collected at each stream on same date.

Test Stream	70	45	35	45	60	60	80
Control Stream	50	40	20	40	30	40	75
Difference (T-C)	20	5	15	5	30	20	5

Statistics for the Difference: Mean = 14.28, standard deviation = 9.76, n = 7
Calculated "t" value = (square root of n)(mean)/standard deviation = 3.86
Tabular "t" value is taken from a table of the "t" distribution for 2 alpha (0.20) and n-1 degrees of freedom. Tabular "t" = 1.44.
Since calculated "t" value is greater than tabular t value, reject the null hypothesis and conclude that the test stream is impaired by color.

Statistical Procedure for Data Sets of Less than Four for Mercury in Fish Tissue

Data Set: data in ug/Kg 130, 230, 450. Mean = 270, Standard Deviation = 163.7
The 50% Confidence Interval = the sample mean plus or minus the quantity:
(0.676)(163.7)/square root 3 = 63.89. Thus the 50% Confidence Interval is 206.11 – 333.89
Since the criterion value, 300 ug/Kg, falls within this 50% Confidence Interval, this water is judged to be unimpaired by mercury in fish tissue but the waterbody is placed in Category 2B or 3B.

Statistical Procedure for Data Sets of Four or More for Mercury in Fish Tissue

Data Set: data in ug/Kg 130, 230, 450, 350, 220. Mean = 276, Std. Deviation = 124.82
The 60% Upper Confidence Limit = the sample mean plus the quantity:
(0.253)(124.82)/square root 5 = 14.12. Thus the 60% UCL is 290.12 ug/Kg.
Since the Upper Confidence Limit is less than the criterion value of 300 ug/Kg, this water is judged to be unimpaired by mercury in fish tissue.

Appendix D
The Meaning of the Sediment Quotient and How to Calculate It

While sediment criteria in the form of Probably Effect Concentrations[23] are given for several individual contaminants, it is recognized that when multiple contaminants occur in sediment, toxicity may occur even though the level of each individual pollutant does not reach toxic levels. The method of estimating the synergistic effects of multiple pollutants in sediments given in McDonald et al [10] is the calculation of a Probably Effect Concentrations Quotient. This calculation is made by dividing the pollutant concentration in the sample by the Probably Effect Concentrations value for that pollutant. These values are summed and normalized by dividing that sum by the number of pollutants.

Example: A sediment sample contains the following results in mg/kg.

Arsenic 2.5, Cadmium 4.5, Copper 17, Lead 100, Zinc 260. The Probably Effect Concentrations values for these five pollutants in respective order are 33, 4.98, 149, 128, 459.

Probably Effect Concentrations Quotient = ((2.5/(33)) + (4.5/(4.98)) + (17/(149)) + (100/(128)) + (260/(459)))/5 = 0. 488

Based on research by McDonald (2000) 83% of sediment samples with Probably Effect Concentrations quotients less than 0.5 were non-toxic while 85% of sediment samples with Probably Effect Concentrations quotients greater than 0.5 were toxic. Based on these findings a Probably Effect Concentrations to insure consistency with the threshold values used for individual pollutants (150% of PEC value), a quotient greater than 0.75 will be judged to be toxic**.**

[23] Level at which harmful effects on the aquatic community are likely to be observed.

Appendix B

Missouri Department of Natural Resources 2014 Section 303(d) List, as approved by the Missouri Clean Water Commission, April 2, 2014.

Year	WBID	Waterbody	Cls	Imp Size	WB Size	Units	Pollutant	Source	IU	OU	U/D County	Up X	Up Y	Down X	Down Y	WBD 8	Comments
2012	2188.00	Antire Cr.	P	1.9	1.9	Mi.	pH (W)	Source Unknown	AQL	LWW, WBC B	St. Louis	712454	4264477	710077	4264450	7140102	1
2012	2188.00	Antire Cr.	P	1.9	1.9	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC B	AQL, LWW	St. Louis	712454	4264477	710077	4264450	7140102	1
2012	752.00	Bass Cr.	C	4.4	4.4	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, LWW	Boone	565032	4297418	561523	4298649	10300102	1
2012	3240.00	Baynham Br.	P	4.0	4.0	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Newton	379681	4092596	374809	4091661	11070207	1
2006	2760.00	Bee Fk.	C	1.4	8.7	Mi.	Lead (W)	Fletcher Lead Mine/Mill	AQL	CLF, LWW, WBC A	Reynolds	668683	4145627	670778	4145985	11010007	1
2014	7309.00	Bee Tree Lake	L3	10.0	10.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, SCR, WBC B	St. Louis	732802	4254630	732802	4254630	7140102	1
2014	3224.00	Beef Br.	P	2.5	2.5	Mi.	Zinc (W)	Mill Tailings	AQL	LWW, WBC B	Newton	366623	4094312	366294	4097417	11070207	1
2014	3224.00	Beef Br.	P	2.5	2.5	Mi.	Cadmium (W)	Mill Tailings	AQL	LWW, WBC B	Newton	366623	4094312	366294	4097417	11070207	1
2014	3224.00	Beef Br.	P	2.5	2.5	Mi.	Cadmium (S)	Mill Tailings	AQL	LWW, WBC B	Newton	366623	4094312	366294	4097417	11070207	1
2014	3224.00	Beef Br.	P	2.5	2.5	Mi.	Lead (S)	Mill Tailings	AQL	LWW, WBC B	Newton	366623	4094312	366294	4097417	11070207	1
2014	3224.00	Beef Br.	P	2.5	2.5	Mi.	Zinc (S)	Mill Tailings	AQL	LWW, WBC B	Newton	366623	4094312	366294	4097417	11070207	1
2006	7365.00	Belcher Branch Lake	L3	42.0	42.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, SCR, WBC B	Buchanan	351273	4382884	351273	4382884	10240012	1
2014	3980.00	Bens Br.	US	5.8	5.8	Mi.	Cadmium (S)	Oronogo Duenweg mining belt	GEN		Jasper	370848	4115314	371064	4111569	11070207	1
2014	3980.00	Bens Br.	US	5.8	5.8	Mi.	Lead (S)	Oronogo Duenweg mining belt	GEN		Jasper	371062	4111571	370847	4115315	11070207	1
2014	3980.00	Bens Br.	US	5.8	5.8	Mi.	Zinc (S)	Oronogo Duenweg mining belt	GEN		Jasper	371062	4111572	370856	4115295	11070207	1
2006	444.00	Big Cr.	P	1.0	31.5	Mi.	Ammonia, Total (W)	Bethany WWTP	AQL	DWS, LWW, WBC B	Harrison	409718	4456625	409046	4455653	10280101	1
2006	444.00	Big Cr.	P	6.1	31.5	Mi.	Oxygen, Dissolved (W)	Bethany WWTP	AQL	DWS, LWW, WBC B	Harrison	409718	4456625	408308	4451142	10280101	1
2012	1250.00	Big Cr.	P	70.5	70.5	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Jackson/Henry	384118	4301049	422204	4249326	10290108	1
1998	2916.00	Big Cr.	P	1.8	34.1	Mi.	Lead (S)	Glover smelter	AQL	CLF, LWW, SCR, WBC A	Iron	704405	4150532	704724	4147919	8020202	1
1998	2916.00	Big Cr.	P	1.8	34.1	Mi.	Cadmium (S)	Glover smelter	AQL	CLF, LWW, SCR, WBC A	Iron	704416	4150529	704726	4147921	8020202	1
2010	1578.00	Big Piney R.	P	4.0	7.8	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	DWS, LWW, SCR, WBC A	Texas	583132	4112464	579840	4108439	10290202	1
2006	2080.00	Big R.	P	52.8	81.3	Mi.	Cadmium (S)	Old Lead Belt tailings	AQL	IND, LWW, WBC A	St. Francois/Jefferson	712112	4194396	701042	4226033	7140104	1
2010	2080.00	Big R.	P	52.3	81.3	Mi.	Lead (S)	Mill Tailings	AQL	IND, LWW, WBC A	St. Francois/Jefferson	712625	4193891	701044	4226032	7140104	1
2012	111.00	Black Cr.	P	19.4	19.4	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Shelby	581883	4405278	593138	4393283	7110005	1

Year	WBID	Waterbody	Cls	Imp Size	WB Size	Units	Pollutant	Source	IU	OU	U/D County	Up X	Up Y	Down X	Down Y	WBD 8	Comments
2012	111.00	Black Cr.	P	19.4	19.4	Mi.	Escherichia coli (W)	Shelbyville WWTF, Nonpoint Source	WBC B	AQL, LWW	Shelby	581883	4405278	593138	4393283	7110005	1
2006	3825.00	Black Cr.	P	1.6	1.6	Mi.	Chloride (W)	Urban Runoff/Storm Sewers	AQL	LWW, SCR, WBC B	St. Louis	731266	4278180	732023	4276834	7140101	1
2012	3825.00	Black Cr.	P	1.6	1.6	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	SCR	AQL, LWW, WBC B	St. Louis	731266	4278180	732023	4276834	7140101	1
2012	3825.00	Black Cr.	P	1.6	1.6	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC B	AQL, LWW, SCR	St. Louis	731266	4278180	732023	4276834	7140101	1
2002	2769.00	Black R.	P	47.1	47.1	Mi.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	CLF, DWS, IRR, LWW, SCR, WBC A	Butler	729886	4078610	729372	4042276	11010007	1
2008	2784.00	Black R.	P	39.0	39.0	Mi.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	CLF, DWS, IRR, LWW, SCR, WBC A	Wayne/Butler	697890	4112203	729886	4078610	11010007	1
2006	3184.00	Blackberry Cr.	C	3.5	6.5	Mi.	Chloride (W)	Asbury Power Plant	AQL	LWW, WBC B	Jasper	360861	4132403	361580	4127893	11070207	1
2008	3184.00	Blackberry Cr.	C	3.5	6.5	Mi.	Total Dissolved Solids (W)	Asbury Power Plant	AQL	LWW, WBC B	Jasper	360856	4132395	361579	4127903	11070207	1
2006	417.00	Blue R.	P	4.4	4.4	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC B	AQL, IND, LWW	Jackson	371184	4329015	373047	4332253	10300101	2
2006	418.00	Blue R.	P	9.4	9.4	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC B	AQL, IND, LWW, SCR	Jackson	368400	4319633	371184	4329015	10300101	1
2006	419.00	Blue R.	P	7.7	7.7	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC A	AQL, LWW, SCR	Jackson	364588	4312669	368400	4319633	10300101	1
2006	421.00	Blue R.	C	12.0	12.0	Mi.	Escherichia coli (W)	Runoff from Forest/Grassland/Parkland, Rural, Residential Areas, Urban Runoff/Storm Sewers	WBC B	AQL, LWW, SCR	Jackson	360459	4301385	364588	4312669	10300101	1
2012	1701.00	Bonhomme Cr.	C	2.5	2.5	Mi.	pH (W)	Source Unknown	AQL	LWW, WBC B	St. Louis	709512	4282258	711491	4284301	10300200	1
2012	1701.00	Bonhomme Cr.	C	2.5	2.5	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC B	AQL, LWW	St. Louis	709512	4282258	711491	4284301	10300200	1
2006	750.00	Bonne Femme Cr.	P	7.8	7.8	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, LWW	Boone	560346	4298772	553749	4294435	10300102	1
2012	753.00	Bonne Femme Cr.	C	7.0	7.0	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Boone	565633	4303361	560346	4298772	10300102	1
2002	2034.00	Bourbeuse R.	P	136.7	136.7	Mi.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	CLF, DWS, IRR, LWW, SCR, WBC A	Phelps/Franklin	622849	4221417	684343	4252206	7140103	1
2012	7003.00	Bowling Green Lake - Old	L1	7.0	7.0	Ac.	Nitrogen, Total (W)*	Rural NPS	AQL	DWS, LWW, WBC B	Pike	658497	4356565	658497	4356565	7110004	1
2012	7003.00	Bowling Green Lake - Old	L1	7.0	7.0	Ac.	Phosphorus, Total (W)*	Rural NPS	AQL	DWS, LWW, WBC B	Pike	658502	4356562	658502	4356562	7110004	1
2014	7003.00	Bowling Green Lake - Old	L1	7.0	7.0	Ac.	Chlorophyll-a (W)*	Rural NPS	AQL	DWS, LWW, WBC B	Pike	658498	4356565	658498	4356565	7110004	1
2012	1796.00	Brazeau Cr.	P	10.8	10.8	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Perry	798229	4172491	807335	4172833	7140105	1
2002	1371.00	Brush Cr.	P	4.7	4.7	Mi.	Oxygen, Dissolved (W)	Humansville WWTP	AQL	LWW, WBC B	Polk/St. Clair	448632	4182404	444769	4187320	10290106	1

Year	WBID	Waterbody	Cls	Imp Size	WB Size	Units	Pollutant	Source	IU	OU	U/D County	Up X	Up Y	Down X	Down Y	WBD 8	Comments
2012	3273.00	Buffalo Cr.	P	8.0	8.0	Mi.	Fishes Bioassessments/Unknown	Source Unknown	AQL	CLF, IRR, LWW, SCR, WBC A	Newton/McDonald	369204	4075685	363942	4068061	11070208	1
2006	1865.00	Burgher Br.	C	1.5	1.5	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, SCR, WBC B	Phelps	610212	4200283	611960	4199017	7140102	1
2006	7057.00	Busch W.A. No. 35 Lake	L3	51.0	51.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, WBC B	St. Charles	697830	4288213	697830	4288213	7110009	1
2010	7627.00	Busch W.A. No. 37 Lake	L3	30.0	30.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, SCR, WBC B	St. Charles	692005	4287348	692005	4287348	7110009	1
2006	3234.00	Capps Cr.	P	5.0	5.0	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, CDF, IRR, LWW, SCR	Barry/Newton	408562	4082428	402563	4083044	11070207	1
2010	2288.00	Castor R.	P	7.5	7.5	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, IRR, LWW, SCR	Bollinger	760131	4115294	766484	4110895	7140107	1
2008	737.00	Cedar Cr.	C	7.9	37.4	Mi.	Aquatic Macroinvertebrate Bioassessments/Unknown	Source Unknown	AQL	LWW, SCR, WBC B	Boone	574525	4320028	573573	4311774	10300102	1
2008	1344.00	Cedar Cr.	P	10.9	31.0	Mi.	Aquatic Macroinvertebrate Bioassessments/Unknown	Source Unknown	AQL	IRR, LWW, SCR, WBC A	Cedar	419908	4170049	422735	4179340	10290106	1
2010	1344.00	Cedar Cr.	P	10.9	31.0	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	IRR, LWW, SCR, WBC A	Cedar	419909	4170046	422734	4179339	10290106	1
2008	1357.00	Cedar Cr.	C	16.2	16.2	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Dade/Cedar	412791	4154079	419820	4170283	10290106	1
2010	1357.00	Cedar Cr.	C	16.2	16.2	Mi.	Aquatic Macroinvertebrate Bioassessments/Unknown	Source Unknown	AQL	LWW, WBC B	Dade/Cedar	412791	4154079	419820	4170283	10290106	1
2006	3203.00	Center Cr.	P	19.0	26.8	Mi.	Cadmium (W)	Tri-State Mining District	AQL	CLF, IND, IRR, LWW, SCR, WBC A	Jasper	377331	4111756	356399	4112875	11070207	1
2006	3203.00	Center Cr.	P	19.0	26.8	Mi.	Cadmium (S)	Tri-State Mining District	AQL	CLF, IND, IRR, LWW, SCR, WBC A	Jasper	377337	4111756	356408	4112884	11070207	1
2006	3203.00	Center Cr.	P	19.0	26.8	Mi.	Lead (S)	Tri-State Mining District	AQL	CLF, IND, IRR, LWW, SCR, WBC A	Jasper	377338	4111757	356399	4112875	11070207	1
2014	3203.00	Center Cr.	P	26.8	26.8	Mi.	Escherichia coli (W)	Nonpoint Source	WBC A	AQL, CLF, IND, IRR, LWW, SCR	Jasper	383685	4107350	356376	4112852	11070207	1
2008	3210.00	Center Cr.	P	21.0	21.0	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, IND, IRR, LWW, SCR	Newton/Jasper	404365	4099517	383685	4107350	11070207	1
2010	3214.00	Center Cr.	P	4.9	4.9	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, CDF, IND, IRR, LWW, SCR	Lawrence/Newton	410298	4100642	404365	4099517	11070207	1
2014	7634.00	Chaumiere Lake	UL	3.4	3.4	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	GEN		Clay	367178	4337088	367178	4337088	10300101	1
2012	1781.00	Cinque Hommes Cr.	P	8.3	17.1	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Perry	779346	4178425	786087	4185609	7140105	1
2006	1333.00	Clear Cr.	P	28.2	28.2	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC A	Vernon/St. Clair	402340	4186711	417795	4205727	10290105	1

Year	WBID	Waterbody	Cls	Imp Size	WB Size	Units	Pollutant	Source	IU	OU	U/D County	Up X	Up Y	Down X	Down Y	WBD 8	Comments
2006	1336.00	Clear Cr.	C	22.3	22.3	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Vernon	391921	4172771	402340	4186711	10290105	1
2006	3238.00	Clear Cr.	P	11.1	11.1	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Lawrence/Newton	410980	4088931	397639	4088317	11070207	1
2002	3239.00	Clear Cr.	C	3.5	3.5	Mi.	Oxygen, Dissolved (W)	Monett WWTP	AQL	LWW, WBC B	Barry/Lawrence	415495	4086458	410980	4088931	11070207	1
2002	3239.00	Clear Cr.	C	3.5	3.5	Mi.	Nutrient/Eutrophication Biol. Indicators (W)	Monett WWTP	AQL	LWW, WBC B	Barry/Lawrence	415495	4086458	410980	4088931	11070207	1
2006	935.00	Clear Fk.	P	3.1	25.8	Mi.	Oxygen, Dissolved (W)	Knob Noster WWTP, Nonpoint Source	AQL	LWW, SCR, WBC B	Johnson	448495	4291442	448650	4293696	10300104	1
2002	7326.00	Clearwater Lake	L2	1635.0	1635.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, SCR, WBC A	Wayne	697891	4112204	697891	4112204	11010007	1
2014	7326.00	Clearwater Lake	L2	1635.0	1635.0	Ac.	Chlorophyll-a (W)*	Rural NPS	AQL	LWW, SCR, WBC A	Wayne	697891	4112204	697891	4112204	11010007	1
2006	1706.00	Coldwater Cr.	C	5.5	5.5	Mi.	Chloride (W)	Urban Runoff/Storm Sewers	AQL	IND, LWW, WBC B	St. Louis	735019	4299846	741431	4301794	10300200	1
2008	1706.00	Coldwater Cr.	C	6.9	6.9	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC B	AQL, IND, LWW	St. Louis	735014	4299849	741449	4301962	10300200	1
2012	2177.00	Coonville Cr.	C	1.3	1.3	Mi.	Lead (W)	Source Unknown	AQL	LWW, WBC B	St. Francois	717474	4206559	716589	4204963	7140104	1
2006	1943.00	Courtois Cr.	P	2.6	32.0	Mi.	Lead (S)	Doe Run Viburnum Division Lead mine	AQL	CLF, LWW, SCR, WBC A	Washington	669868	4181478	670865	4184583	7140102	1
2006	1943.00	Courtois Cr.	P	2.6	32.0	Mi.	Zinc (S)	Doe Run Viburnum Division Lead mine	AQL	CLF, LWW, SCR, WBC A	Washington	669862	4181470	670877	4184596	7140102	1
2012	2382.00	Crane Cr.	P	13.2	13.2	Mi.	Aquatic Macroinvertebrate Bioassessments/Unknown	Source Unknown	AQL	CDF, LWW, SCR, WBC A	Stone	445954	4088238	456895	4081483	11010002	1
2012	2816.00	Craven Ditch	C	11.6	11.6	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	IRR, LWW, SCR	Butler	730995	4068609	730730	4052473	11010007	1
2006	1703.00	Creve Coeur Cr.	C	3.8	3.8	Mi.	Chloride (W)	Urban Runoff/Storm Sewers	AQL	LWW, WBC B	St. Louis	718172	4283167	718455	4287491	10300200	1
2006	1703.00	Creve Coeur Cr.	C	3.8	3.8	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	St. Louis	718172	4283167	718455	4287491	10300200	1
2006	1703.00	Creve Coeur Cr.	C	3.8	3.8	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC B	AQL, LWW	St. Louis	718172	4283167	718455	4287491	10300200	1
2006	1928.00	Crooked Cr.	P	3.5	3.5	Mi.	Cadmium (W)	Buick Lead Smelter	AQL	CLF, LWW, WBC A	Crawford	662216	4173989	658201	4175646	7140102	1
2006	1928.00	Crooked Cr.	P	3.5	3.5	Mi.	Cadmium (S)	Buick Lead Smelter	AQL	CLF, LWW, WBC A	Crawford	662216	4173989	658201	4175646	7140102	1
2006	1928.00	Crooked Cr.	P	3.5	3.5	Mi.	Lead (S)	Buick Lead Smelter	AQL	CLF, LWW, WBC A	Crawford	662216	4173989	658201	4175646	7140102	1
2008	3961.00	Crooked Cr.	US	6.8	6.8	Mi.	Cadmium (W)	Buick Smelter	GEN		Iron/Dent	664596	4168505	662197	4173781	7140102	1
2010	3961.00	Crooked Cr.	US	6.8	6.8	Mi.	Copper (W)	Buick Smelter	GEN		Iron/Dent	664588	4168517	662197	4173782	7140102	1
2006	2636.00	Current R.	P	124.0	124.0	Mi.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	CLF, IRR, LWW, SCR, WBC A	Shannon/Ripley	628633	4137638	696834	4041519	11010008	1
2006	219.00	Dardenne Cr.	P1	7.0	7.0	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, SCR, WBC B	St. Charles	708078	4300264	713786	4304316	7110009	1

Year	WBID	Waterbody	Cls	Imp Size	WB Size	Units	Pollutant	Source	IU	OU	U/D County	Up X	Up Y	Down X	Down Y	WBD 8	Comments
2002	221.00	Dardenne Cr.	P	16.5	16.5	Mi.	Aquatic Macroinvertebrate Bioassessments/Unknown	Source Unknown	AQL	LWW, SCR, WBC B	St. Charles	692485	4289827	708078	4300264	7110009	2
2006	221.00	Dardenne Cr.	P	16.5	16.5	Mi.	Sedimentation/Siltation (S)	Source Unknown	AQL	LWW, SCR, WBC B	St. Charles	692485	4289827	708078	4300264	7110009	2
2006	3826.00	Deer Cr.	P	1.6	1.6	Mi.	Chloride (W)	Urban Runoff/Storm Sewers	AQL	LWW, SCR, WBC A	St. Louis/St. Louis City	732023	4276834	733741	4275807	7140101	1
2012	3826.00	Deer Cr.	P	1.6	1.6	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	SCR	AQL, LWW, WBC A	St. Louis/St. Louis City	732023	4276834	733741	4275807	7140101	1
2012	3826.00	Deer Cr.	P	1.6	1.6	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC A	AQL, LWW, SCR	St. Louis/St. Louis City	732023	4276834	733741	4275807	7140101	1
2002	7015.00	Deer Ridge Community Lake	L3	39.0	39.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, SCR, WBC B	Lewis	599833	4448447	599833	4448447	7110002	1
2006	3109.00	Ditch #36	P	7.8	7.8	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Dunklin	770137	4018408	767863	4007224	8020204	1
2006	3810.00	Douger Br.	C	3.1	3.1	Mi.	Lead (S)	Aurora lead mining district	AQL	LWW	Lawrence	432983	4092649	428971	4092384	11070207	1
2006	3810.00	Douger Br.	C	3.1	3.1	Mi.	Zinc (S)	Aurora lead mining district	AQL	LWW	Lawrence	432983	4092649	428971	4092384	11070207	1
2006	1180.00	Dousinbury Cr.	P	3.9	3.9	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Dallas	506028	4158604	501716	4160952	10290110	1
2008	3189.00	Dry Fk.	C	10.2	10.2	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, LWW	Jasper	391617	4123451	379518	4128240	11070207	1
2012	1314.00	Dry Wood Cr.	P	3.8	29.9	Mi.	Total Dissolved Solids (W)	Acid Mine Drainage	AQL	LWW, WBC B	Barton	361693	4158074	361439	4162037	10290104	1
2006	3569.00	Dutro Carter Cr.	P	0.5	1.5	Mi.	Oxygen, Dissolved (W)	Rolla SE WWTP	AQL	LWW, WBC B	Phelps	611946	4199021	612708	4199006	7140102	1
2010	372.00	E. Fk. Crooked R.	P	19.9	19.9	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Ray	418043	4367620	423049	4349970	10300101	1
2006	457.00	E. Fk. Grand R.	P	28.7	28.7	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, DWS, IRR, LWW, SCR	Worth/Gentry	388817	4483394	384234	4450462	10280101	2
2008	608.00	E. Fk. Locust Cr.	P	16.7	16.7	Mi.	Escherichia coli (W)	Municipal Point Source Discharges, Nonpoint Source	WBC B	AQL, LWW	Sullivan	490788	4450893	485177	4432656	10280103	1
2008	610.00	E. Fk. Locust Cr.	C	14.8	15.7	Mi.	Oxygen, Dissolved (W)	Rural NPS	AQL	LWW, SCR, WBC A	Sullivan	492629	4468112	490930	4451859	10280103	1
2008	610.00	E. Fk. Locust Cr.	C	15.7	15.7	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, LWW, SCR	Sullivan	492641	4468112	490788	4450893	10280103	1
2006	1282.00	E. Fk. Tebo Cr.	C	10.4	14.5	Mi.	Oxygen, Dissolved (W)	Windsor SW WWTP	AQL	LWW, WBC B	Henry	453388	4263004	446906	4257222	10290108	1
2006	2166.00	Eaton Br.	C	1.2	1.2	Mi.	Cadmium (W)	Leadwood tailings pond	AQL	LWW, SCR	St. Francois	710945	4193695	712097	4194409	7140104	1
2006	2166.00	Eaton Br.	C	1.2	1.2	Mi.	Cadmium (S)	Leadwood tailings pond	AQL	LWW, SCR	St. Francois	710945	4193695	712097	4194409	7140104	1
2006	2166.00	Eaton Br.	C	1.2	1.2	Mi.	Lead (S)	Leadwood tailings pond	AQL	LWW, SCR	St. Francois	710945	4193695	712097	4194409	7140104	1
2006	2166.00	Eaton Br.	C	1.2	1.2	Mi.	Zinc (W)	Leadwood tailings pond	AQL	LWW, SCR	St. Francois	710945	4193695	712097	4194409	7140104	1
2006	2166.00	Eaton Br.	C	1.2	1.2	Mi.	Zinc (S)	Leadwood tailings pond	AQL	LWW, SCR	St. Francois	710945	4193695	712097	4194409	7140104	1

Year	WBID	Waterbody	Cls	Imp Size	WB Size	Units	Pollutant	Source	IU	OU	U/D County	Up X	Up Y	Down X	Down Y	WBD 8	Comments
2002	2593.00	Eleven Point R.	P	22.7	22.7	Mi.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	CLF, IRR, LWW, SCR, WBC A	Oregon	658823	4067446	663687	4040687	11010011	1
2006	2597.00	Eleven Point R.	P	11.4	11.4	Mi.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	CDF, LWW, SCR, WBC A	Oregon	648216	4073792	658823	4067446	11010011	1
2008	2601.00	Eleven Point R.	P	22.3	22.3	Mi.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	CLF, LWW, SCR, WBC A	Oregon	626147	4076649	648216	4073792	11010011	1
2006	1283.00	Elm Br.	C	3.0	3.0	Mi.	Oxygen, Dissolved (W)	Windsor SE WWTP	AQL	LWW, SCR, WBC B	Henry	455758	4264046	453816	4261489	10290108	1
2012	1704.00	Fee Fee Cr. (new)	P	1.5	1.5	Mi.	Chloride (W)	Urban Runoff/Storm Sewers	AQL	LWW, WBC B	St. Louis	720613	4290506	718639	4290795	10300200	1
2012	1704.00	Fee Fee Cr. (new)	P	1.5	1.5	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC B	AQL, LWW	St. Louis	720613	4290506	718639	4290795	10300200	1
2012	7237.00	Fellows Lake	L1	800.0	800.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	DWS, LWW, SCR, WBC A	Greene	479585	4129878	479585	4129878	10290106	1
2012	3595.00	Fenton Cr.	P	0.5	0.5	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC B	AQL, LWW	St. Louis	723865	4265429	724629	4265304	7140102	1
2008	2186.00	Fishpot Cr.	P	3.5	3.5	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC B	AQL, LWW	St. Louis	715611	4270777	718256	4269401	7140102	1
2012	2186.00	Fishpot Cr.	P	3.5	3.5	Mi.	Chloride (W)	Urban Runoff/Storm Sewers	AQL	LWW, WBC B	St. Louis	715611	4270777	718256	4269401	7140102	1
2006	2168.00	Flat River Cr.	C	4.7	10.0	Mi.	Cadmium (W)	Old Lead Belt tailings	AQL	LWW, WBC B	St. Francois	717605	4190862	719860	4196746	7140104	1
2010	7151.00	Forest Lake	L1	580.0	580.0	Ac.	Chlorophyll-a (W)*	Rural NPS	AQL	DWS, LWW, WBC A	Adair	529121	4446689	529121	4446689	10280202	1
2010	7151.00	Forest Lake	L1	580.0	580.0	Ac.	Nitrogen, Total (W)*	Rural NPS	AQL	DWS, LWW, WBC A	Adair	529121	4446690	529121	4446690	10280202	1
2010	7151.00	Forest Lake	L1	580.0	580.0	Ac.	Phosphorus, Total (W)*	Rural NPS	AQL	DWS, LWW, WBC A	Adair	529118	4446689	529118	4446689	10280202	1
2006	747.00	Fowler Cr.	C	6.0	6.0	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Boone	567705	4291358	568085	4285215	10300102	1
2012	1842.00	Fox Cr.	P	7.2	7.2	Mi.	Aquatic Macroinvertebrate Bioassessments/Unknown	Source Unknown	AQL	LWW, WBC B	St. Louis	698956	4266805	702113	4258893	7140102	1
2008	38.00	Fox R.	P	42.0	42.0	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW, SCR	Clark	591716	4495662	619844	4469932	7110001	1
2010	7008.00	Fox Valley Lake	L3	89.0	89.0	Ac.	Phosphorus, Total (W)*	Rural NPS	AQL	LWW, SCR, WBC B	Clark	604600	4483686	604600	4483686	7110001	1
2014	7008.00	Fox Valley Lake	L3	89.0	89.0	Ac.	Chlorophyll-a (W)*	Agriculture	AQL	LWW, SCR, WBC B	Clark	604601	4483675	604601	4483675	7110001	1
2014	7008.00	Fox Valley Lake	L3	89.0	89.0	Ac.	Nitrogen, Total (W)*	Agriculture	AQL	LWW, SCR, WBC B	Clark	604599	4483679	604599	4483679	7110001	1
2010	7382.00	Foxboro Lake	L3	22.0	22.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, SCR, WBC B	Franklin	644959	4249576	644959	4249576	7140103	1
2002	7280.00	Frisco Lake	L3	5.0	5.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, WBC B	Phelps	608340	4201513	608340	4201513	7140102	1
2012	1004.00	Gans Cr.	C	5.5	5.5	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, LWW	Boone	562859	4305362	558288	4303469	10300102	1
2002	1455.00	Gasconade R.	P	264.0	264.0	Mi.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	CLF, DWS, LWW, SCR, WBC A	Wright/Gasconade	543608	4120607	626331	4281831	10290202	1
2002	2184.00	Grand Glaize Cr.	C	4.0	4.0	Mi.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, WBC B	St. Louis	720447	4272244	721056	4270200	7140102	1
2006	2184.00	Grand Glaize Cr.	C	4.0	4.0	Mi.	Chloride (W)	Urban Runoff/Storm Sewers	AQL	LWW, WBC B	St. Louis	720447	4272244	721056	4270200	7140102	1

Year	WBID	Waterbody	Cls	Imp Size	WB Size	Units	Pollutant	Source	IU	OU	U/D County	Up X	Up Y	Down X	Down Y	WBD 8	Comments
2008	2184.00	Grand Glaize Cr.	C	4.0	4.0	Mi.	Escherichia coli (W)	Municipal, Urbanized High Density Area, Urban Runoff/Storm Sewers	WBC B	AQL, LWW	St. Louis	720447	4272244	721056	4270200	7140102	1
2006	593.00	Grand R.	P	56.0	56.0	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, DWS, IRR, LWW, SCR	Livingston/Chariton	454151	4399076	490791	4359355	10280103	1
2012	593.00	Grand R.	P	56.0	56.0	Mi.	Escherichia coli (W)	Rural NPS	SCR	AQL, DWS, IRR, LWW, WBC A	Livingston/Chariton	454151	4399076	490791	4359355	10280103	1
2006	1712.00	Gravois Cr.	P	2.3	2.3	Mi.	Escherichia coli (W)	Municipal, Urbanized High Density Area, Urban Runoff/Storm Sewers	WBC B	AQL, LWW	St. Louis/St. Louis City	735408	4269269	737783	4270129	7140101	2
2008	1712.00	Gravois Cr.	P	2.3	2.3	Mi.	Chloride (W)	Urban Runoff/Storm Sewers	AQL	LWW, WBC B	St. Louis/St. Louis City	735408	4269269	737783	4270129	7140101	2
2006	1713.00	Gravois Cr.	C	6.0	6.0	Mi.	Chloride (W)	Urban Runoff/Storm Sewers	AQL	LWW, WBC B	St. Louis	731101	4269870	735408	4269269	7140101	1
2006	1713.00	Gravois Cr.	C	6.0	6.0	Mi.	Escherichia coli (W)	Municipal, Urbanized High Density Area, Urban Runoff/Storm Sewers	WBC B	AQL, LWW	St. Louis	731101	4269870	735408	4269269	7140101	1
2006	1009.00	Grindstone Cr.	C	2.5	2.5	Mi.	Escherichia coli (W)	Runoff from Forest/Grassland/Parkland, Rural, Residential Areas, Urban Runoff/Storm Sewers	WBC A	AQL, LWW	Boone	561330	4309115	558769	4308985	10300102	1
2014	7386.00	Harrison County Lake	L1	280.0	280.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	DWS, LWW, WBC B	Harrison	407760	4472463	407760	4472463	10280101	1
2008	7152.00	Hazel Creek Lake	L1	453.0	453.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	DWS, LWW, WBC B	Adair	531552	4461098	531552	4461098	10280201	1
2010	7152.00	Hazel Creek Lake	L1	453.0	453.0	Ac.	Chlorophyll-a (W)*	Rural NPS	AQL	DWS, LWW, WBC B	Adair	531556	4461098	531556	4461098	10280201	1
2008	848.00	Heaths Cr.	P	21.0	21.0	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	CLF, LWW, WBC B	Pettis/Cooper	481311	4306305	498383	4308084	10300103	1
2014	596.00	Hickory Br.	C	6.8	6.8	Mi.	Oxygen, Dissolved (W)	Rural NPS	AQL	LWW, WBC B	Chariton	492740	4382070	484609	4381385	10280103	1
2006	3226.00	Hickory Cr.	P	4.9	4.9	Mi.	Escherichia coli (W)	Runoff from Forest/Grassland/Parkland, Rural, Residential Areas	WBC A	AQL, LWW	Newton	381782	4079307	377855	4083987	11070207	1
2012	1008.00	Hinkson Cr.	C	18.8	18.8	Mi.	Escherichia coli (W)	Runoff from Forest/Grassland/Parkland, Rural, Residential Areas	WBC A	AQL, LWW, SCR	Boone	567735	4324925	557334	4308969	10300102	1
2012	1011.00	Hominy Br.	C	1.0	1.0	Mi.	Escherichia coli (W)	Runoff from Forest/Grassland/Parkland, Rural, Residential Areas, Urban Runoff/Storm Sewers	WBC B	AQL, LWW, SCR	Boone	561244	4310832	560154	4310816	10300102	1
2010	3169.00	Honey Cr.	P	16.5	16.5	Mi.	Escherichia coli (W)	Rural NPS runoff	WBC B	AQL, LWW	Lawrence	441810	4098909	423404	4104004	11070207	1
2010	3170.00	Honey Cr.	C	2.7	2.7	Mi.	Escherichia coli (W)	Rural NPS runoff	WBC B	AQL, LWW	Lawrence	443610	4095816	441810	4098909	11070207	1
2008	1348.00	Horse Cr.	P	27.7	27.7	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	IRR, LWW, WBC B	Vernon/Cedar	405029	4166750	422134	4180183	10290106	1

Year	WBID	Waterbody	Cls	Imp Size	WB Size	Units	Pollutant	Source	IU	OU	U/D County	Up X	Up Y	Down X	Down Y	WBD 8	Comments
2010	1348.00	Horse Cr.	P	27.7	27.7	Mi.	Aquatic Macroinvertebrate Bioassessments/Unknown	Source Unknown	AQL	IRR, LWW, WBC B	Vernon/Cedar	405029	4166750	422134	4180183	10290106	1
2014	3413.00	Horseshoe Cr.	C	5.8	5.8	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Lafayette/Jackson	404067	4315232	403598	4321954	10300101	1
2002	7388.00	Hough Park Lake	L3	10.0	10.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, WBC B	Cole	571196	4266084	571196	4266084	10300102	1
2012	7029.00	Hunnewell Lake	L3	228.0	228.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, SCR, WBC B	Shelby	597507	4395785	597507	4395785	7110004	1
2002	420.00	Indian Cr.	C	3.4	3.4	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC A	AQL, IND, LWW	Jackson	360621	4311182	364588	4312669	10300101	1
2010	420.00	Indian Cr.	C	3.4	3.4	Mi.	Chloride (W)	Road/Bridge Runoff, Non-construction	AQL	IND, LWW, WBC A	Jackson	360621	4311182	364588	4312669	10300101	1
2010	1946.00	Indian Cr.	P	1.9	1.9	Mi.	Zinc (S)	Doe Run Viburnum Division Lead mine	AQL	LWW, WBC B	Washington	668798	4178896	669872	4181483	7140102	1
2012	1946.00	Indian Cr.	P	1.9	1.9	Mi.	Lead (S)	Doe Run Viburnum Division Lead mine	AQL	LWW, WBC B	Washington	668798	4178896	669872	4181483	7140102	1
2006	3256.00	Indian Cr.	P	9.7	30.8	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, CLF, IRR, LWW, SCR	Newton/McDonald	390072	4072826	381952	4065143	11070208	1
2008	7389.00	Indian Creek Community Lake	L3	185.0	185.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, SCR, WBC B	Livingston	440538	4416531	440538	4416531	10280101	1
2012	3223.00	Jacobs Br.	P	1.6	1.6	Mi.	Zinc (W)	Tri-State Mining District	AQL	LWW, WBC B	Newton	365485	4095641	365862	4097358	11070207	1
2014	3223.00	Jacobs Br.	P	1.6	1.6	Mi.	Cadmium (W)	Mill Tailings	AQL	LWW, WBC B	Newton	365485	4095641	365862	4097358	11070207	1
2014	3223.00	Jacobs Br.	P	1.6	1.6	Mi.	Cadmium (S)	Mill Tailings	AQL	LWW, WBC B	Newton	365485	4095641	365862	4097358	11070207	1
2014	3223.00	Jacobs Br.	P	1.6	1.6	Mi.	Lead (S)	Mill Tailings	AQL	LWW, WBC B	Newton	365485	4095641	365862	4097358	11070207	1
2014	3223.00	Jacobs Br.	P	1.6	1.6	Mi.	Zinc (S)	Mill Tailings	AQL	LWW, WBC B	Newton	365485	4095641	365862	4097358	11070207	1
2012	3207.00	Jenkins Cr.	P	2.8	2.8	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, LWW	Jasper	389303	4103152	386194	4105401	11070207	1
2014	3208.00	Jenkins Cr.	C	4.8	4.8	Mi.	Escherichia coli (W)	Agriculture	WBC A	AQL, LWW	Newton/Jasper	393119	4101129	389303	4103152	11070207	1
2012	3205.00	Jones Cr.	P	7.5	7.5	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, CLF, LWW	Newton/Jasper	388104	4099353	383685	4107350	11070207	1
2012	3592.00	Keifer Cr.	P	1.2	1.2	Mi.	Chloride (W)	Urban Runoff/Storm Sewers	AQL	LWW, WBC A	St. Louis	713475	4270033	714845	4269588	7140102	1
2012	3592.00	Keifer Cr.	P	1.2	1.2	Mi.	Escherichia coli (W)	Runoff from Forest/Grassland/Parkland, Rural, Residential Areas	WBC A	AQL, LWW	St. Louis	713475	4270033	714845	4269588	7140102	1
2008	1529.00	L. Beaver Cr.	C	3.5	3.5	Mi.	Sedimentation/Siltation (S)	Smith Sand and Gravel	AQL	LWW, WBC A	Phelps	602527	4199503	600308	4195828	10290203	1
2014	1529.00	L. Beaver Cr.	C	3.5	3.5	Mi.	Escherichia coli (W)	Municipal Point Source Discharges	WBC A	AQL, LWW	Phelps	602527	4199503	600308	4195828	10290203	1
2012	422.00	L. Blue R.	P	35.1	35.1	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC B	AQL, LWW, SCR	Jackson	372712	4309259	394916	4340608	10300101	1
2012	1003.00	L. Bonne Femme Cr.	P	9.0	9.0	Mi.	Escherichia coli (W)	Source Unknown	WBC B	AQL, LWW	Boone	558288	4303469	553242	4296685	10300102	1

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2006	1863.00	L. Dry Fk.	P	1.0	5.2	Mi.	Oxygen, Dissolved (W)	Rolla SE WWTP	AQL	LWW, SCR, WBC B	Phelps	613267	4199796	614362	4200448	7140102	1
2006	1864.00	L. Dry Fk.	C	0.6	4.7	Mi.	Oxygen, Dissolved (W)	Rolla SE WWTP	AQL	LWW, WBC B	Phelps	612755	4198995	613258	4199800	7140102	1
2008	1864.00	L. Dry Fk.	C	4.7	4.7	Mi.	Oxygen, Dissolved (W)	Rolla SE WWTP	AQL	LWW, WBC B	Phelps	613005	4192818	612727	4198982	7140102	1
2006	1325.00	L. Dry Wood Cr.	P	20.5	20.5	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Vernon	376904	4174682	376740	4191482	10290104	1
2010	1326.00	L. Dry Wood Cr.	C	15.6	15.6	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Barton/Vernon	379798	4162808	376904	4174682	10290104	1
2010	3279.00	L. Lost Cr.	P	5.8	5.8	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Newton	362556	4080613	355717	4078288	11070206	1
2006	623.00	L. Medicine Cr.	P	39.8	39.8	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Mercer/Grundy	464025	4492224	467988	4439145	10280103	1
2006	623.00	L. Medicine Cr.	P	19.8	39.8	Mi.	Aquatic Macroinvertebrate Bioassessments/Unknown	Source Unknown	AQL	LWW, WBC B	Mercer	463960	4492230	465770	4469240	10280103	1
2006	1189.00	L. Niangua R.	P	20.2	43.8	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	CLF, LWW, SCR, WBC A	Dallas/Hickory	499870	4188127	491901	4206838	10290110	1
2004	3652.00	L. Osage R.	C	23.6	23.6	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Vernon	358279	4206140	378073	4204995	10290103	2
2014	2854.00	L. St. Francis R.	P	24.2	32.4	Mi.	Lead (S)	Catherine Lead Mine, pos. Mine La Motte	AQL	CLF, DWS, LWW, SCR, WBC A	Madison	735771	4165598	726082	4157726	8020202	1
2012	2229.00	L. Whitewater Cr.	P	24.2	24.2	Mi.	Aquatic Macroinvertebrate Bioassessments/Unknown	Source Unknown	AQL	LWW, WBC A	Bollinger/Cape Girardeau	759234	4159953	782136	4144237	7140107	1
2002	7469.00	Lake Buteo	L3	7.0	7.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, WBC A	Johnson	449405	4289087	449405	4289087	10300104	4
2002	7436.00	Lake of the Woods	L3	3.0	3.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, WBC B	Boone	565550	4313830	565550	4313830	10300102	1
2008	7629.00	Lake of the Woods	UL	7.0	7.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	GEN		Jackson	368315	4317421	368315	4317421	10300101	1
2010	7054.00	Lake St. Louis	L3	444.0	444.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, WBC A	St. Charles	694062	4297113	694062	4297113	7110009	1
2014	7055.00	Lake Ste. Louise	L3	71.0	71.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, WBC A	St. Charles	691846	4296923	691846	4296923	7110009	1
2010	7212.00	Lake Winnebago	L3	272.0	272.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, SCR, WBC A	Cass	382248	4297460	382248	4297460	10290108	1
2006	847.00	Lamine R.	P	64.0	64.0	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, IRR, LWW, SCR	Morgan/Cooper	504073	4279987	513022	4314616	10300103	1
2006	3105.00	Lateral #2 Main Ditch	P	11.5	11.5	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Stoddard	774316	4075750	773639	4058046	8020204	1
2008	3105.00	Lateral #2 Main Ditch	P	11.5	11.5	Mi.	Temperature, water (W)	Channelization	AQL	LWW, WBC B	Stoddard	774316	4075750	773639	4058046	8020204	1
2012	3137.00	Lee Rowe Ditch	C	6.0	6.0	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Mississippi	824366	4076900	824243	4068035	8020201	1
2002	7020.00	Lewistown Lake	L1	35.0	35.0	Ac.	Atrazine (W)	Agriculture	DWS	AQL, LWW, SCR, WBC B	Lewis	600676	4439291	600676	4439291	7110002	3
2012	3575.00	Line Cr.	C	7.0	7.0	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC B	AQL, LWW	Platte	358975	4343373	360133	4335563	10240011	1
2006	606.00	Locust Cr.	P	37.7	91.7	Mi.	Escherichia coli (W)	Rural NPS	SCR	AQL, DWS, LWW, WBC B	Putnam/Sullivan	488062	4492444	485937	4450771	10280103	1
2006	606.00	Locust Cr.	P	37.7	91.7	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, DWS, LWW, SCR	Putnam/Sullivan	488061	4492447	485932	4450780	10280103	1
2012	2763.00	Logan Cr.	P	6.1	36.0	Mi.	Lead (S)	Sweetwater Lead Mine/Mill	AQL	LWW, SCR, WBC A	Reynolds	666297	4135268	666165	4127460	11010007	1

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2006	696.00	Long Branch Cr.	C	1.8	14.8	Mi.	Oxygen, Dissolved (W)	Atlanta WWTP	AQL	LWW, SCR, WBC B	Macon	543323	4416546	543605	4414156	10280203	1
2002	7097.00	Longview Lake	L2	953.0	953.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, SCR, WBC A	Jackson	372710	4309262	372710	4309262	10300101	1
2006	3278.00	Lost Cr.	P	8.5	8.5	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, CLF, LWW, SCR	Newton	365739	4083856	355717	4078288	11070206	1
2010	123.00	M. Fk. Salt R.	C	11.4	25.4	Mi.	Oxygen, Dissolved (W)	Macon WWTP, Nonpoint Source	AQL	LWW, WBC B	Macon	550935	4400206	554273	4390082	7110006	1
2006	2814.00	Main Ditch	C	13.0	13.0	Mi.	Temperature, water (W)	Channelization	AQL	IRR, LWW, WBC B	Butler	732529	4068029	728374	4048617	11010007	1
2006	2814.00	Main Ditch	C	13.0	13.0	Mi.	pH (W)	Poplar Bluff WWTP	AQL	IRR, LWW, WBC B	Butler	732529	4068029	728374	4048617	11010007	1
2012	1709.00	Maline Cr.	C	0.6	0.6	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC B	AQL, LWW, SCR	St. Louis/St. Louis City	741069	4291198	741513	4290475	7140101	1
2012	3839.00	Maline Cr.	C	0.5	0.5	Mi.	Chloride (W)	Urban Runoff/Storm Sewers	AQL	LWW, SCR	St. Louis City	741513	4290475	743767	4287000	7140101	1
2010	3140.00	Maple Slough	C	18.2	18.2	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Mississippi/New Madrid	820609	4090553	816878	4062805	8020201	1
2002	7033.00	Mark Twain Lake	L2	18132.0	18132.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	DWS, LWW, SCR, WBC A	Ralls	616550	4375856	616550	4375856	7110007	1
2014	3596.00	Mattese Cr.	P	1.1	1.1	Mi.	Chloride (W)	Urban Runoff/Storm Sewers	AQL	LWW, SCR, WBC B	St. Louis	733139	4260643	732308	4259650	7140102	1
2014	3596.00	Mattese Cr.	P	1.1	1.1	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC B	AQL, LWW, SCR	St. Louis	733139	4260643	732308	4259650	7140102	1
2006	619.00	Medicine Cr.	P	43.8	43.8	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Putnam/Grundy	471740	4492250	467988	4439145	10280103	1
2008	2183.00	Meramec R.	P	22.8	22.8	Mi.	Lead (S)	Old Lead belt tailings	AQL	DWS, IND, LWW, SCR, WBC A	St. Louis	718256	4269401	732150	4252184	7140102	1
2008	2185.00	Meramec R.	P	15.7	15.7	Mi.	Lead (S)	Old Lead Belt tailings	AQL	CLF, DWS, IND, LWW, SCR, WBC A	Jefferson/St. Louis	707821	4260833	718256	4269401	7140102	1
1994	1299.00	Miami Cr.	P	19.6	19.6	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Bates	372360	4240637	383003	4222753	10290102	1
2006	468.00	Middle Fk. Grand R.	P	27.5	27.5	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, IRR, LWW, SCR	Worth/Gentry	385572	4488578	381803	4452419	10280101	1
2010	3262.00	Middle Indian Cr.	C	3.5	3.5	Mi.	Aquatic Macroinvertebrate Bioassessments/Unknown	Source Unknown	AQL	LWW, SCR, WBC A	Newton	400092	4074869	395454	4074061	11070208	1
2008	3263.00	Middle Indian Cr.	P	2.2	2.2	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Newton	395454	4074061	392652	4075387	11070208	1
2010	3263.00	Middle Indian Cr.	P	2.2	2.2	Mi.	Aquatic Macroinvertebrate Bioassessments/Unknown	Source Unknown	AQL	LWW, WBC B	Newton	395454	4074061	392652	4075387	11070208	1
2014	1707.03	Mississippi R.	P	44.6	44.6	Mi.	Escherichia coli (W)	Municipal Point Source Discharges, Nonpoint Source	WBC B	AQL, DWS, IND, LWW, SCR	St. Louis/Ste. Genevieve	732150	4252184	769132	4207187	7140101	1
2010	226.00	Missouri R.	P	184.5	184.5	Mi.	Escherichia coli (W)	Municipal Point Source Discharges, Nonpoint Source	WBC B	AQL, DWS, IND, IRR, LWW, SCR	Atchison/Jackson	265899	4496416	361019	4330707	10240009	1
2012	356.00	Missouri R.	P	129.0	129.0	Mi.	Escherichia coli (W)	Municipal Point Source Discharges, Nonpoint Source	SCR	AQL, DWS, IND, IRR, LWW, WBC B	Jackson/Chariton	361019	4330707	503487	4351401	10300101	1

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2012	356.00	Missouri R.	P	129.0	129.0	Mi.	Escherichia coli (W)	Municipal Point Source Discharges, Nonpoint Source	WBC B	AQL, DWS, IND, IRR, LWW, SCR	Jackson/Chariton	361019	4330707	503487	4351401	10300101	1
2008	1604.00	Missouri R.	P	33.9	104.5	Mi.	Escherichia coli (W)	Municipal Point Source Discharges, Nonpoint Source	WBC B	AQL, DWS, IND, IRR, LWW, SCR	St. Charles/St. Louis	714448	4289612	750286	4299158	10300200	1
2014	7031.00	Monroe City Lake	L1	94.0	94.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	DWS, LWW, SCR, WBC A	Ralls	614623	4384928	614623	4384928	7110007	1
2010	7402.00	Mozingo Lake	L1	898.0	898.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	DWS, LWW, SCR, WBC B	Nodaway	348769	4467994	348769	4467994	10240013	1
2008	853.00	Muddy Cr.	P	62.2	62.2	Mi.	Aquatic Macroinvertebrate Bioassessments/Unknown	Source Unknown	AQL	LWW, WBC B	Pettis	458149	4281754	495127	4299752	10300103	1
2006	674.00	Mussel Fk.	C	29.0	29.0	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, DWS, LWW	Sullivan/Macon	509539	4450637	513872	4410410	10280202	1
2008	3186.00	N. Fk. Spring R.	P	17.4	17.4	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW, SCR	Jasper	379518	4128240	363884	4125753	11070207	1
2006	3188.00	N. Fk. Spring R.	C	1.1	55.9	Mi.	Ammonia, Total (W)	Lamar WWTP	AQL	LWW, SCR, WBC B	Barton	386254	4148800	386721	4148123	11070207	1
2006	3188.00	N. Fk. Spring R.	C	55.9	55.9	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, SCR, WBC B	Dade/Jasper	408705	4131497	379518	4128240	11070207	1
2008	3188.00	N. Fk. Spring R.	C	55.9	55.9	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW, SCR	Dade/Jasper	408705	4131497	379518	4128240	11070207	1
2008	3260.00	N. Indian Cr.	P	5.2	5.2	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Newton	395488	4077540	390081	4072821	11070208	1
2012	3260.00	N. Indian Cr.	P	5.2	5.2	Mi.	Aquatic Macroinvertebrate Bioassessments/Unknown	Source Unknown	AQL	LWW, WBC B	Newton	395488	4077540	390081	4072821	11070208	1
2006	1170.00	Niangua R.	P	56.0	56.0	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, CLF, LWW, SCR	Webster/Dallas	507117	4144345	512225	4176338	10290110	1
2014	227.00	Nishnabotna R.	P	10.2	10.2	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, DWS, IRR, LWW, SCR	Atchison	276742	4495889	271481	4484915	10240004	1
2006	550.00	No Cr.	P	28.7	28.7	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Grundy/Livingston	461790	4446877	451131	4415226	10280102	1
2010	550.00	No Cr.	P	28.7	28.7	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Grundy/Livingston	461790	4446877	451131	4415226	10280102	1
2002	7316.00	Noblett Lake	L3	26.0	26.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, WBC A	Douglas	579889	4085045	579889	4085045	11010006	1
2014	7316.00	Noblett Lake	L3	26.0	26.0	Ac.	Chlorophyll-a (W)*	Nonpoint Source	AQL	LWW, WBC A	Douglas	579888	4085045	579888	4085045	11010006	1
2014	7316.00	Noblett Lake	L3	26.0	26.0	Ac.	Phosphorus, Total (W)*	Nonpoint Source	AQL	LWW, WBC A	Douglas	579889	4085046	579889	4085046	11010006	1
2010	279.00	Nodaway R.	P	59.3	59.3	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, IRR, LWW, SCR	Nodaway/Andrew	328881	4493666	331916	4418596	10240010	1
2010	7109.00	North Bethany City Reservoir	L3	78.0	78.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, SCR, WBC A	Harrison	412395	4463016	412395	4463016	10280101	1
2006	170.00	North Fk. Cuivre R.	C	8.0	8.0	Mi.	Fecal Coliform (W)	Rural NPS	WBC B	AQL, LWW	Pike	651684	4345260	656761	4337088	7110008	3
2010	1293.00	Osage R.	P	39.3	39.3	Mi.	Oxygen, Dissolved (W)	Source Unknown	***	***	Vernon/St.Clair	453701	4183192	444285	4187603	10290105	1

Year	WBID	Waterbody	Cls	Imp Size	WB Size	Units	Pollutant	Source	IU	OU	U/D County	Up X	Up Y	Down X	Down Y	WBD 8	Comments
2006	1373.00	Panther Cr.	C	9.7	9.7	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Polk/St. Clair	453742	4183206	444279	4187593	10290106	1
2006	2373.00	Pearson Cr.	P	8.0	8.0	Mi.	Escherichia coli (W)	Livestock,Grazing or Feeding Operations, Urban Runoff/Storm Sewers	WBC A	AQL, LWW	Greene	486612	4121328	482571	4113045	11010002	1
2008	7628.00	Perry Phillips Lake	UL	32.0	32.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	GEN		Boone	561236	4305581	561236	4305581	10300102	1
2012	215.00	Peruque Cr.	P1	9.6	9.6	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, SCR, WBC B	St. Charles	700317	4301742	705352	4308025	7110009	1
2012	216.00	Peruque Cr.	P	0.3	10.3	Mi.	Cause Unknown	Lake St. Louis Dam	AQL	LWW, SCR, WBC B	St. Charles	693918	4297117	694138	4297484	7110009	1
2002	217.00	Peruque Cr.	P	4.0	4.0	Mi.	Fishes Bioassessments/Unknown	Nonpoint Source	AQL	LWW, SCR, WBC B	St. Charles	686322	4296816	690798	4295430	7110009	3
2002	218.00	Peruque Cr.	C	10.9	10.9	Mi.	Fishes Bioassessments/Unknown	Nonpoint Source	AQL	LWW, SCR, WBC B	Warren/St. Charles	674302	4297979	686322	4296816	7110009	3
2006	1755.00	Pickle Cr.	P	7.8	7.8	Mi.	pH (W)	Atmospheric Deposition - Acidity	AQL	LWW, WBC B	Ste. Genevieve	738455	4187974	746104	4191429	7140105	1
2010	2815.00	Pike Cr.	C	6.0	6.0	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	IRR, LWW	Butler	727556	4074154	732529	4068029	11010007	1
2010	312.00	Platte R.	P	142.4	142.4	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, DWS, IRR, LWW, SCR	Worth/Platte	370620	4492569	341432	4347540	10240012	1
2012	1327.00	Pleasant Run Cr.	C	7.6	7.6	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Vernon	381362	4169529	376904	4174682	10290104	1
2006	3120.00	Pole Cat Slough	P	12.6	12.6	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Dunklin	763796	4013691	755748	3998563	8020204	1
2014	3120.00	Pole Cat Slough	P	12.6	12.6	Mi.	Temperature, water (W)	Source Unknown	AQL	LWW, WBC B	Dunklin	763796	4013691	755748	3998563	8020204	1
2014	1440.00	Pomme de Terre R.	P	69.1	69.1	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, LWW, SCR	Webster/Polk	506083	4131874	465307	4180755	10290107	1
2006	2038.00	Red Oak Cr.	C	10.1	10.0	Mi.	Oxygen, Dissolved (W)	Owensville WWTP	AQL	LWW, WBC B	Gasconade	631423	4239850	642015	4246717	7140103	2
2006	1710.00	River des Peres	P	2.6	2.6	Mi.	Chloride (W)	Urban Runoff/Storm Sewers	AQL	LWW, SCR	St. Louis City	736562	4271521	738968	4268398	7140101	1
2010	1710.00	River des Peres	P	2.6	2.6	Mi.	Oxygen, Dissolved (W)	Municipal, Urbanized High Density Area, Urban Runoff/Storm Sewers	AQL	LWW, SCR	St. Louis City	736562	4271521	738968	4268398	7140101	1
2012	1710.00	River des Peres	P	2.6	2.6	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	SCR	AQL, LWW	St. Louis City	736562	4271521	738968	4268398	7140101	1
2006	3972.00	River des Peres	US	6.5	6.5	Mi.	Chloride (W)	Urban Runoff/Storm Sewers	GEN		St. Louis	731228	4283842	734092	4282681	7140101	1,5
2006	655.00	S. Blackbird Cr.	C	13.0	13.0	Mi.	Ammonia, Total (W)	Source Unknown	AQL	LWW, WBC B	Putnam	503682	4475363	518712	4469745	10280201	2
2010	71.00	S. Fabius R.	P	80.6	80.6	Mi.	Escherichia coli (W)	Nonpoint Source	WBC B	AQL, IRR, LWW	Knox/Marion	572794	4444457	627750	4417637	7110003	1
1994	142.00	S. Fk. Salt R.	C	20.1	40.1	Mi.	Oxygen, Dissolved (W)	Mexico WWTP, Source Unknown	AQL	LWW, SCR, WBC B	Callaway/Audrain	600364	4322884	596694	4341638	7110006	1
2006	1249.00	S. Grand R.	P	66.8	66.8	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW, SCR	Cass/Henry	366728	4281000	429978	4242884	10290108	1
2008	3259.00	S. Indian Cr.	P	8.7	8.7	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, CDF, LWW	McDonald/Newton	399208	4067538	390081	4072821	11070208	1

Year	WBID	Waterbody	Cls	Imp Size	WB Size	Units	Pollutant	Source	IU	OU	U/D County	Up X	Up Y	Down X	Down Y	WBD 8	Comments
2012	3259.00	S. Indian Cr.	P	8.7	8.7	Mi.	Aquatic Macroinvertebrate Bioassessments/Unknown	Source Unknown	AQL	CDF, LWW, WBC B	McDonald/Newton	399208	4067538	390081	4072821	11070208	1
2010	594.00	Salt Cr.	C	14.9	14.9	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Chariton	491540	4377934	485852	4365132	10280103	1
2014	893.00	Salt Fk.	P	13.3	26.7	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, SCR, WBC B	Saline	472648	4336520	486215	4328728	10300104	1
2012	2113.00	Salt Pine Cr.	C	1.2	1.2	Mi.	Aquatic Macroinvertebrate Bioassessments/Unknown	Barite tailings pond	AQL	LWW, WBC B	Washington	698656	4214467	697844	4216050	7140104	1
2008	91.00	Salt R.	P	29.0	29.0	Mi.	Oxygen, Dissolved (W)	Mark Twain Lake re-regulation dam	AQL	DWS, IRR, LWW, SCR, WBC A	Ralls/Pike	622770	4380470	654484	4376225	7110007	1
2012	103.00	Salt R.[1]	P1	9.3	9.3	Mi.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	DWS, IRR, LWW, SCR, WBC A	Ralls	616554	4375853	622770	4380500	7110007	1
2014	103.00	Salt R.[1]	P1	9.3	9.3	Mi.	Oxygen, Dissolved (W)	Cannon Dam	AQL	DWS, IRR, LWW, SCR, WBC A	Ralls	616554	4375853	622770	4380500	7110007	1
2014	2119.00	Shibboleth Br.	P	1.0	1.0	Mi.	Lead (S)	Mill Tailings	AQL	LWW, WBC B	Washington	705148	4210760	706311	4210501	7140104	1
2014	2119.00	Shibboleth Br.	P	1.0	1.0	Mi.	Zinc (S)	Mill Tailings	AQL	LWW, WBC B	Washington	705148	4210760	706311	4210501	7140104	1
2008	3222.00	Shoal Cr.	P	41.1	41.1	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, CLF, DWS, IND, IRR, LWW, SCR	Newton	401984	4083455	356098	4099733	11070207	1
2014	3754.00	Slater Br.	C	3.7	3.7	Mi.	Escherichia coli (W)	Nonpoint Source	WBC B	AQL, LWW	Jasper	372935	4129976	369417	4127684	11070207	1
2006	399.00	Sni-a-bar Cr.	P	36.6	36.6	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, SCR, WBC B	Jackson/Lafayette	398859	4311016	416463	4333103	10300101	1,6
2012	224.00	Spencer Cr.	C	1.5	1.5	Mi.	Chloride (W)	St. Peters WWTP, Urban Runoff/Storm Sewers	AQL	LWW, SCR	St. Charles	708205	4298105	709432	4300121	7110009	1
2006	3160.00	Spring R.	P	61.7	61.7	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, CLF, IND, IRR, LWW, SCR	Lawrence/Jasper	420405	4108691	356380	4117694	11070207	1
2010	3164.00	Spring R.	P	8.8	8.8	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, CDF, IND, IRR, LWW, SCR	Lawrence	425936	4100897	420405	4108691	11070207	1
2010	3165.00	Spring R.	P	11.9	11.9	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, LWW, SCR	Lawrence	430983	4088423	425936	4100897	11070207	1
2012	2835.00	St. Francis R.	P	8.4	93.1	Mi.	Temperature, water (W)	Source Unknown	CLF	AQL, IRR, LWW, SCR, WBC A	St. Francois	725310	4181290	728440	4173621	8020202	1
2006	3138.00	St. Johns Ditch	P	15.3	15.3	Mi.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, SCR, WBC B	New Madrid	807943	4079163	817828	4057590	8020201	1
2006	3138.00	St. Johns Ditch	P	15.3	15.3	Mi.	Escherichia coli (W)	Rural NPS, Urban Runoff/Storm Sewers	WBC B	AQL, LWW, SCR	New Madrid	807943	4079163	817828	4057590	8020201	1
2006	3135.00	Stevenson Bayou	C	6.4	6.4	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Mississippi	833337	4094443	831489	4086239	8020201	1
2006	959.00	Straight Fk.	C	6.0	6.0	Mi.	Oxygen, Dissolved (W)	Versailles WWTP	AQL	LWW, WBC B	Morgan	513048	4255154	514134	4262987	10300102	1
2006	2751.00	Strother Cr.	P	6.0	6.0	Mi.	Zinc (S)	Buick Lead Mine/Mill	AQL	CLF, LWW, WBC B	Iron/Reynolds	672401	4162649	680292	4163603	11010007	1
2008	2751.00	Strother Cr.	P	6.0	6.0	Mi.	Nickel (S)	Buick Lead Mine/Mill	AQL	CLF, LWW, WBC B	Iron/Reynolds	672401	4162649	680292	4163603	11010007	1

Year	WBID	Waterbody	Cls	Imp Size	WB Size	Units	Pollutant	Source	IU	OU	U/D County	Up X	Up Y	Down X	Down Y	WBD 8	Comments
2008	2751.00	Strother Cr.	P	6.0	6.0	Mi.	Lead (S)	Buick Lead Mine/Mill	AQL	CLF, LWW, WBC B	Iron/Reynolds	672401	4162649	680292	4163603	11010007	1
2010	2751.00	Strother Cr.	P	6.0	6.0	Mi.	Lead (W)	Buick Lead Mine/Mill	AQL	CLF, LWW, WBC B	Iron/Reynolds	672401	4162649	680292	4163603	11010007	1
2010	2751.00	Strother Cr.	P	6.0	6.0	Mi.	Zinc (W)	Buick Lead Mine/Mill	AQL	CLF, LWW, WBC B	Iron/Reynolds	672401	4162649	680292	4163603	11010007	1
2014	2751.00	Strother Cr.	P	6.0	6.0	Mi.	Aquatic Macroinvertebrate Bioassessments/Unknown	Buick MIne	AQL	CLF, LWW, WBC B	Iron/Reynolds	672401	4162649	680292	4163603	11010007	1
2006	3965.00	Strother Cr.	US	0.9	0.9	Mi.	Zinc (S)	Buick Lead Mine/Mill	GEN		Reynolds/Iron	671143	4161738	672403	4162650	11010007	1
2008	3965.00	Strother Cr.	US	0.9	0.9	Mi.	Arsenic (S)	Buick Lead Mine/Mill	GEN		Reynolds/Iron	671133	4161733	672400	4162646	11010007	1
2008	3965.00	Strother Cr.	US	0.9	0.9	Mi.	Nickel (S)	Buick Lead Mine/Mill	GEN		Reynolds/Iron	671139	4161736	672405	4162651	11010007	1
2008	3965.00	Strother Cr.	US	0.9	0.9	Mi.	Lead (S)	Buick Lead Mine/Mill	GEN		Reynolds/Iron	671133	4161733	672402	4162649	11010007	1
2012	3965.00	Strother Cr.	US	0.9	0.9	Mi.	Zinc (W)	Buick Lead Mine/Mill	GEN		Reynolds/Iron	671137	4161735	672405	4162650	11010007	1
2006	686.00	Sugar Cr.	P	6.8	6.8	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Randolph	544656	4369584	538213	4368067	10280203	1
2014	7166.00	Sugar Creek Lake	L1	308.0	308.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	DWS, LWW, WBC B	Randolph	544675	4369570	544675	4369570	10280203	1
2006	7399.00	Sunset Lake	L3	6.0	6.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, WBC B	Cole	569901	4268413	569901	4268413	10300102	1
2002	7313.00	Table Rock Lake	L2	24218.0	41747.0	Ac.	Chlorophyll-a (W)*	Municipal Point Source Discharges, Nonpoint Source	AQL	LWW, SCR, WBC A	Taney	472136	4050038	472136	4050038	11010001	1
2002	7313.00	Table Rock Lake	L2	24216.0	41747.0	Ac.	Nitrogen, Total (W)*	Municipal Point Source Discharges, Nonpoint Source	AQL	LWW, SCR, WBC A	Taney	472138	4050042	472138	4050042	11010001	1
2002	7313.00	Table Rock Lake	L2	41747.0	41747.0	Ac.	Nutrient/Eutrophication Biol. Indicators (W)*	Municipal Point Source Discharges, Nonpoint Source	AQL	LWW, SCR, WBC A	Taney	472135	4050041	472135	4050041	11010001	1
2010	7297.00	Terre Du Lac Lakes	L3	103.0	371.4	Ac.	Chlorophyll-a (W)*	Terre du Lac Subdivision	AQL	LWW, SCR, WBC A	St. Francois	708570	4197156	708570	4197156	7140104	1
2010	7297.00	Terre Du Lac Lakes	L3	103.0	371.4	Ac.	Nitrogen, Total (W)*	Terre du Lac Subdivision	AQL	LWW, SCR, WBC A	St. Francois	708570	4197151	708570	4197151	7140104	1
2008	549.00	Thompson R.	P	5.2	70.6	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, DWS, IRR, LWW	Harrison	432172	4492124	430916	4488363	10280102	1
2012	3243.00	Thurman Cr.	P	3.0	3.0	Mi.	Escherichia coli (W)	Runoff from Forest/Grassland/Parkland, Rural, Residential Areas	WBC B	AQL, LWW	Newton	369319	4099003	367458	4097252	11070207	1
2010	2114.00	Trib. Old Mines Cr.	C	1.5	1.5	Mi.	Sedimentation/Siltation (S)	Barite tailings pond	GEN	AQL, LWW, WBC B	Washington	699696	4215163	698452	4216961	7140104	1
2012	3963.00	Trib. to Chat Cr.	US	0.9	0.9	Mi.	Cadmium (W)	Subsurface, Hardrock, Mining	GEN		Lawrence	437551	4092594	436381	4092419	11070207	1
2012	3963.00	Trib. to Chat Cr.	US	0.9	0.9	Mi.	Zinc (W)	Subsurface, Hardrock, Mining	GEN		Lawrence	437560	4092575	436381	4092418	11070207	1
2010	133.00	Trib. to Coon Cr.	C	2.0	2.0	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Randolph	552198	4364074	554325	4364132	7110006	2

Year	WBID	Waterbody	Cls	Imp Size	WB Size	Units	Pollutant	Source	IU	OU	U/D County	Up X	Up Y	Down X	Down Y	WBD 8	Comments
2011	3938.00	Trib. to Flat R.	US	0.3	0.3	Mi.	Zinc (W)	Elvins Chat Pile	GEN		St. Francois	717153	4191147	717584	4190839	7140104	1
2010	1420.00	Trib. to Goose Cr.	C	3.0	3.0	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Lawrence	437166	4110190	440767	4112989	10290106	1
2006	3490.00	Trib. to L. Muddy Cr.	C	1.0	1.0	Mi.	Chloride (W)	Tyson Foods	AQL	LWW, WBC B	Pettis	473618	4290951	474708	4291640	10300103	1
2006	3360.00	Trib. to Red Oak Cr.	P	0.5	0.5	Mi.	Oxygen, Dissolved (W)	Owensville WWTP	AQL	LWW, WBC B	Gasconade	635575	4245150	636297	4244762	7140103	2
2006	3361.00	Trib. to Red Oak Cr.	C	1.9	1.9	Mi.	Oxygen, Dissolved (W)	Owensville WWTP, Source Unknown	AQL	LWW, SCR	Gasconade	632983	4245771	635575	4245150	7140103	2
2014	3981.00	Trib. to Shoal Cr.	US	1.6	1.6	Mi.	Cadmium (W)	Tanyard Hollow Pits	GEN		Jasper/Newton	360497	4102911	360999	4100170	11070207	1
2014	3981.00	Trib. to Shoal Cr.	US	1.6	1.6	Mi.	Zinc (W)	Tanyard Hollow Pits	GEN		Jasper/Newton	360493	4102902	360998	4100170	11070207	1
2014	3982.00	Trib. to Shoal Cr.	US	2.2	2.2	Mi.	Zinc (W)	Maiden Lane Pits	GEN		Jasper/Newton	363556	4103320	363401	4100264	11070207	1
2014	3983.00	Trib. to Turkey Cr.	US	2.9	2.9	Mi.	Cadmium (S)	aban. smelter site -	GEN		Jasper	364260	4105805	364073	4108154	11070207	1
2014	3983.00	Trib. to Turkey Cr.	US	2.9	2.9	Mi.	Lead (S)	aban. smelter site	GEN		Jasper	364259	4105803	364073	4108154	11070207	1
2014	3983.00	Trib. to Turkey Cr.	US	2.9	2.9	Mi.	Zinc (S)	aban. smelter site	GEN		Jasper	364261	4105805	364069	4108156	11070207	1
2014	3983.00	Trib. to Turkey Cr.	US	2.9	2.9	Mi.	Zinc (W)	aban. smelter site	GEN		Jasper	364060	4108161	364262	4105804	11070207	1
2014	3984.00	Trib. to Turkey Cr.	US	2.2	2.2	Mi.	Zinc (W)	Leadwood Hollow pits	GEN		Jasper	362856	4108621	362494	4105702	11070207	1
2014	3985.00	Trib. to Turkey Cr.	US	1.6	1.6	Mi.	Zinc (W)	Chitwood Hollow pits	GEN		Jasper	361695	4107018	361609	4109130	11070207	1
2006	956.00	Trib. to Willow Fk.	C	0.5	0.5	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW	Moniteau	520018	4276045	520577	4275439	10300102	1
2006	3589.00	Trib. to Wolf Cr.	C	1.5	1.5	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	St. Francois	727181	4185394	729121	4184284	8020202	2
2006	74.00	Troublesome Cr.	C	6.1	41.3	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, SCR, WBC B	Knox	581617	4441608	586195	4437679	7110003	1
2012	3175.00	Truitt Cr.	C	6.4	6.4	Mi.	Escherichia coli (W)	Source Unknown	GEN	AQL, LWW	Lawrence	429512	4115867	424213	4108968	11070207	2
2012	751.00	Turkey Cr.	C	6.3	6.3	Mi.	Escherichia coli (W)	Source Unknown	WBC A	AQL, LWW	Boone	565489	4300829	560346	4298772	10300102	1
2006	3216.00	Turkey Cr.	P	7.7	7.7	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC B	AQL, LWW	Jasper	366144	4107717	356267	4109959	11070207	1
2006	3216.00	Turkey Cr.	P	7.7	7.7	Mi.	Cadmium (S)	Tri-State Mining District	AQL	LWW, WBC B	Jasper	366144	4107717	356267	4109959	11070207	1
2006	3216.00	Turkey Cr.	P	7.7	7.7	Mi.	Zinc (S)	Tri-State Mining District	AQL	LWW, WBC B	Jasper	366144	4107717	356267	4109959	11070207	1
2006	3216.00	Turkey Cr.	P	7.7	7.7	Mi.	Cadmium (W)	Tri-State Mining District	AQL	LWW, WBC B	Jasper	366144	4107717	356267	4109959	11070207	1
2008	3216.00	Turkey Cr.	P	7.7	7.7	Mi.	Lead (S)	Tri-State Mining District	AQL	LWW, WBC B	Jasper	366144	4107717	356267	4109959	11070207	1
2006	3217.00	Turkey Cr.	P	6.1	6.1	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC A	AQL, LWW	Jasper	373143	4104208	366144	4107717	11070207	1
2006	3217.00	Turkey Cr.	P	6.1	6.1	Mi.	Cadmium (S)	Tri-State Mining District	AQL	LWW, WBC A	Jasper	373143	4104208	366144	4107717	11070207	1
2006	3217.00	Turkey Cr.	P	6.1	6.1	Mi.	Zinc (S)	Tri-State Mining District	AQL	LWW, WBC A	Jasper	373143	4104208	366144	4107717	11070207	1

Year	WBID	Waterbody	Cls	Imp Size	WB Size	Units	Pollutant	Source	IU	OU	U/D County	Up X	Up Y	Down X	Down Y	WBD 8	Comments
2006	3282.00	Turkey Cr.	P	2.4	2.4	Mi.	Cadmium (W)	Bonne Terre chat pile	AQL	LWW, WBC B	St. Francois	715493	4200128	714636	4203638	7140104	1
2006	3282.00	Turkey Cr.	P	2.4	2.4	Mi.	Lead (W)	Bonne Terre chat pile	AQL	LWW, WBC B	St. Francois	715493	4200128	714636	4203638	7140104	1
2006	3282.00	Turkey Cr.	P	1.2	2.4	Mi.	Zinc (W)	Bonne Terre chat pile	AQL	LWW, WBC B	St. Francois	715072	4201827	715495	4200135	7140104	1
2010	1414.00	Turnback Cr.	P	19.9	19.9	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, CDF, LWW, SCR	Lawrence/Dade	445684	4108548	432264	4127720	10290106	1
2008	2755.00	W. Fk. Black R.	P	2.1	32.3	Mi.	Lead (S)	West Fork Mine	AQL	CLF, LWW, WBC A	Reynolds	667310	4151001	669784	4151630	11010007	1
2008	2755.00	W. Fk. Black R.	P	2.1	32.3	Mi.	Nickel (S)	West Fork Lead Mine/Mill	AQL	CLF, LWW, WBC A	Reynolds	667305	4151008	669785	4151637	11010007	1
2006	1317.00	W. Fk. Dry Wood Cr.	C	8.1	8.1	Mi.	Oxygen, Dissolved (W)	Source Unknown	AQL	LWW, WBC B	Vernon	357350	4172196	363431	4175252	10290104	1
2006	2579.00	Warm Fk. Spring R.	P	13.8	13.8	Mi.	Fecal Coliform (W)	Source Unknown	WBC A	AQL, IRR, LWW, SCR	Oregon	627789	4054485	631878	4040300	11010010	1
2006	1708.00	Watkins Cr.	C	1.4	1.4	Mi.	Chloride (W)	Urban Runoff/Storm Sewers	AQL	LWW, WBC B	St. Louis/St. Louis City	744084	4294764	745936	4294861	7140101	1
2006	1708.00	Watkins Cr.	C	1.4	1.4	Mi.	Escherichia coli (W)	Urban Runoff/Storm Sewers	WBC B	AQL, LWW	St. Louis/St. Louis City	744084	4294764	745936	4294861	7140101	1
2010	7071.00	Weatherby Lake	L3	185.0	185.0	Ac.	Nitrogen, Total (W)*	Urban Runoff/Storm Sewers	AQL	LWW, SCR, WBC A	Platte	352918	4343554	352918	4343554	10240011	1
2012	7071.00	Weatherby Lake	L3	185.0	185.0	Ac.	Chlorophyll-a (W)*	Urban Runoff/Storm Sewers	AQL	LWW, SCR, WBC A	Platte	352913	4343568	352913	4343568	10240011	1
2012	7071.00	Weatherby Lake	L3	185.0	185.0	Ac.	Mercury in Fish Tissue (T)	Atmospheric Deposition - Toxics	AQL	LWW, SCR, WBC A	Platte	352918	4343569	352918	4343569	10240011	1
2014	7071.00	Weatherby Lake	L3	185.0	185.0	Ac.	Phosphorus, Total (W)*	Urban Runoff/Storm Sewers	AQL	LWW, SCR, WBC A	Platte	352909	4343562	352909	4343562	10240011	1
2006	560.00	Weldon R.	P	43.4	43.4	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Mercer/Grundy	448318	4492214	444714	4439341	10280102	1
2008	1504.00	Whetstone Cr.	P	12.2	12.2	Mi.	Oxygen, Dissolved (W)	Livestock,Grazing or Feeding Operations	AQL	CLF, LWW, WBC B	Wright	556418	4116032	553965	4129663	10290201	1
2010	3182.00	White Oak Cr.	C	18.0	18.0	Mi.	Escherichia coli (W)	Rural NPS runoff	WBC A	AQL, IRR, LWW	Lawrence/Jasper	415932	4124150	396440	4113581	11070207	1
2012	1700.00	Wildhorse Cr.	C	3.9	3.9	Mi.	Escherichia coli (W)	Runoff from Forest/Grassland/Parkland, Rural, Residential Areas	WBC B	AQL, LWW	St. Louis	699002	4276141	699384	4279922	10300200	1
2010	3171.00	Williams Cr.	P	1.0	1.0	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, CDF, LWW	Lawrence	421759	4107281	420777	4107593	11070207	1
2010	3172.00	Williams Cr.	P	8.5	8.5	Mi.	Escherichia coli (W)	Rural NPS	WBC A	AQL, LWW	Lawrence	432044	4105526	421759	4107281	11070207	1
2012	3594.00	Williams Cr.	P	1.0	1.0	Mi.	Escherichia coli (W)	Runoff from Forest/Grassland/Parkland, Rural, Residential Areas	WBC B	AQL, LWW	St. Louis	716804	4268162	716672	4269382	7140102	1
2010	3280.00	Willow Br.	P	2.2	2.2	Mi.	Escherichia coli (W)	Rural NPS	WBC B	AQL, LWW	Newton	366154	4086266	364028	4084114	11070206	1
2014	3280.00	Willow Br.	P	2.2	2.2	Mi.	Cadmium (S)	Mill Tailings	AQL	LWW, WBC B	Newton	366154	4086266	364028	4084114	11070206	1
2014	3280.00	Willow Br.	P	2.2	2.2	Mi.	Lead (S)	Mill Tailings	AQL	LWW, WBC B	Newton	366154	4086266	364028	4084114	11070206	1
2014	3280.00	Willow Br.	P	2.2	2.2	Mi.	Zinc (S)	Mill Tailings	AQL	LWW, WBC B	Newton	366154	4086266	364028	4084114	11070206	1
2006	955.00	Willow Fk.	C	6.8	6.8	Mi.	Oxygen, Dissolved (W)	Tipton WWTP, Source Unknown	AQL	LWW, WBC B	Moniteau	515565	4276527	522997	4273676	10300102	1

Year	WBID	Waterbody	Cls	Imp Size	WB Size	Units	Pollutant	Source	IU	OU	U/D County	Up X	Up Y	Down X	Down Y	WBD 8	Comments
2006	2375.00	Wilsons Cr.	P	11.9	14.0	Mi.	Escherichia coli (W)	Nonpoint Source	WBC B	AQL, LWW	Greene/Christian	468463	4116799	464366	4102525	11010002	1
2014	2429.00	Woods Fk.	C	5.5	5.5	Mi.	Fishes Bioassessments/Unknown	Source Unknown	AQL	LWW, WBC B	Christian	480105	4082576	483619	4077550	11010003	1

Water quality data summaries for waters on this list can be found on the department's 303(d) Web site at:
http://www.dnr.mo.gov/env/wpp/waterquality/303d.htm

Key to List

*Lakes listed for nutrients will be re-evaluated when new nutrient criteria are developed and promulgated.

[1] WBID 103 will be changed to 7566 in the next Standards Revision.

Yr= Year this water body/pollutant was added to the 303(d) List

WBID= unique water body indentification number

WB Size: Size of the entire waterbody

CL= water body classification in state water quality standards: P= permanently flowing waters, C= intermittent streams, L1= Drinking water lakes, L2= large multi-purpose lakes, L3= other recreational lakes, US= unclassified stream, UL= unclassified lake

Pollutants = reason the water is impaired. Cd=Cadmium, Ni= Nickel, Pb= Lead, Zn = Zinc, SO4 = sulfate, Cl= chloride, FC = fecal coliform bacteria, NVSS = non-volatile (mineral) suspended solids, D.O. = dissolved oxygen, pH= degree of acidity or alkalinity of water, Hydromod.= Hydromodification, which is typically related to the operation of dams. (W) pollutant is in the water, (S) pollutant is in the sediment, (T) pollutant is in fish tissue. If none of these three options are shown, the pollutant is in the water.

Sources = the pollutant source causing the impairment. WWTP= wastewater treatment plant, PP= Power Plant, Unk.= Unknown, Aban. = Abandoned, Atmospheric Dep. = Atmospheric deposition (primarily rainfall), Mult.= Multiple, NPS= Non-point source, Pt.= Point Source, Rereg. Dam= Reregulation Dam - a low dam downstream of a larger hydroelectric dam.

IU = Impaired Beneficial Use(s). Those beneficial uses, assigned to this water in state water quality standards, that are not being met due to water pollution.

OU= Unimpaired Beneficial Use(s). Those beneficial uses assigned to this water in state water quality standard, that are not affected by the pollution. Use codes for IU and UU columns are: G= General Criteria, 1G = General criteria pertaining to protection of aquatic life, 1= Protection of aquatic life, 2 = Whole Body Contact Recreation (swimming), 3= Public Drinking Water Supply, 4 = Livestock and Wildlife Watering, 5= Secondary Contact Recreation (Fishing and Boating), 6= Irrigation, 7= Industrial Water

Up X = X coordinate of upstream end of impaired water body (in UTM)

Up Y = Y coordinate of upstream end of impaired water body (in UTM)

Down X = X coordinate of downstream end of impaired water body (in UTM)

Down Y = Y coordinate of downstream end of impaired water body (in UTM)

County U/D = County the impaired segment is in. If the impaired segment is is more than one county, the county of the upstream and downstream ends of the impaired segment are given

Comment: 1= 2014 Assessment indicates impairment, 2= assessment shows existing data insufficient to show 'good cause' for de-listing. 3=Assessed as unimpaired but expected to be retained by EPA, 4= Listed as WBID 7196, Knob Noster St.Pk. Lakes on 2012 List, 5= Listed as WBID 3827, River des Peres on 2012 List, 6= TMDL only addressed Lake Lotawana WWTP.

Missouri Department of Natural Resources, Water Protection Program

Missouri Department of Natural Resources 2014 Section 303(d) De-Listed Waters as Approved by the Missouri Clean Water Commission, April 2, 2014.

Year	WBID	Water Body Name	Pollutant	Delisting Reason	Delisting Comment
2014	3265	Beaver Br.	Aquatic Macroinvertebrate Bioassessments/Unknown	WQS attained; original listing incorrect	Re-assessed based on small candidate reference stream scores, not wadeable reference scores.
2014	3966	Bee Fk.	Lead (S)	WQS attained; original listing incorrect	Reassessed based on geomean vs arithmetic mean as referenced in MacDonalds paper.
2014	2673	Big Cr.	Oxygen, Dissolved	WQS attained; recovery reason unknown	5/45 (11%) samples did not meet in 2012 listing, 2014 listing 5/68 (7.3%) did not meet.
2014	2080	Big R.	Zinc (S)	WQS attained; original listing incorrect	Reassessed based on geomean vs arithmetic mean as referenced in MacDonalds paper.
2014	968	Burris Fk.	Oxygen, Dissolved	WQS attained; new assessment method	Used binomial probability method instead of straight percent calculation.
2014	3168	Chat Cr.	Zinc	4A - TMDL approved or established by EPA	TMDL approved 2006
2014	3168	Chat Cr.	Cadmium	WQS attained; recovery reason unknown	Only one exceedence in last three yrs of data, 2003, 04,06. Addn. mon. scheduled 2013.
2014	1706	Coldwater Cr.	Oxygen, Dissolved	WQS attained; new assessment method	used binomial probability error rate for large sample sizes.
2014	222	Dardenne Cr.	Oxygen, Dissolved	WQS attained; new assessment method	used binomial probability error rate rather than straight percentage.
2014	221	Dardenne Cr.	Oxygen, Dissolved	WQS attained; new assessment method	used binomial probability error rate rather than straight percentage.
2014	690	Dark Cr.	Oxygen, Dissolved	WQS attained; new assessment method	Used binomial probability for large sample sizes rather than straight percent
2014	36	Des Moines R.	Escherichia coli	WQS attained; recovery reason unknown	2005,2006 and 2011 data show compliance with WQ standard
2014	3178	Dry Fk.	Aquatic Macroinvertebrate Bioassessments	Status unknown - Orig listing in error	stream too small to be assessed against regional ref. streams
2014	3964	East Whetstone Cr.	Ammonia, Total	4A - TMDL approved or established by EPA	TMDL for ammonia, BOD approved 2002.
2014	2184	Grand Glaize Cr.	Oxygen, Dissolved	WQS attained; recovery reason unknown	
2014	97	Hays Cr.	Aquatic Macroinvertebrate Bioassessments	WQS attained; original listing incorrect	Re-assessed based on small candidate reference stream scores, not wadeable reference scores.
2014	3374	Jordan	Aquatic Macroinvertebrate Bioassessments	Status unknown - Orig listing in error	Needs to be Re-assessed based on small candidate reference stream scores, not wadeable reference scores.
2014	7196	Knob Noster St. Park Lakes	Mercury in Fish Tissue	WQS attained; due to change in WQS	Lake Buteo was removed from this WBID and given a new WBID number (7469). That waterbody will be added to 2014 303d list.
2014	2171	Koen Cr.	Fishes Bioassessments	Status unknown - Orig listing in error	Invalid data used for listing.
2014	3839	Maline Cr.	pH	WQS attained; new assessment method	Re-evaluated using binomial probability, type one error rate on a decision of mpaired was 0.457.
2014	1709	Maline Cr.	Chloride	WQS attained; recovery reason unknown	Addn. data 2010, 2011. Now meets LMD definintion of unimpaired stream.
2014	2183	Meramec R.	Escherichia coli	WQS attained; recovery reason unknown	Most recent 3 yrs of data shows compliance with standard
2014	853	Muddy Cr.	Chloride	WQS attained; recovery reason unknown	Last 3 yrs of data do not exceed chloride standard
2014	170	N. Fk. Cuivre R.	Oxygen, Dissolved	WQS attained; new assessment method	used binomial probability rather than straight percent calculation.
2014	2373	Pearson Cr.	Aquatic Macroinvertebrate Bioassessments	Status unknown - Orig listing in error	Needs to be Re-assessed based on small candidate reference stream scores, not wadeable reference scores.
2014	3827	River des Peres	Escherichia coli	Status unknown - Orig listing in error	This segment changed due to re-segmentation, no monitoring sites in this waterbody.
2014	3827	River des Peres	Chloride	Status unknown - Orig listing in error	segment changed due to re-segmentation, no monitoring sites in this waterbody
2014	2170	Shaw Br.	Cadmium (S)	WQS attained; original listing incorrect	Reassessed based on geomean vs arithmetic mean as referenced in MacDonalds paper.
2014	959	Straight Fk.	Chloride	4B - TMDL Alternative	PILO waiting EPA approval.

Year	WBID	Water Body Name	Pollutant	Delisting Reason	Delisting Comment
2014	3763	Tiff Cr.	Fishes Bioassessments	WQS attained; new assessment method	
2014	1225	Trib. to Big Otter Cr.	Oxygen, Dissolved	WQS attained; new assessment method	Used binomial probability rather than straight percent calculation.
2014	3943	Trib. to Foster Br.	Ammonia, Total	WQS attained; due to restoration action	Ashland has upgraded WWTP, are now running a lagoon and mech. plant hybrid
2014	74	Troublesome Cr.	Aquatic Macroinvertebrate Bioassessments	4C - Not caused by a pollutant	SHAPP scores indicate aq. habitat problems.
2014	3217	Turkey Cr.	Lead (S)	WQS attained; original listing incorrect	Reassessed based on geomean vs arithmetic mean as referenced in MacDonalds paper.
2014	1708	Watkins Cr.	pH	WQS attained; new assessment method	Used binomial probability rather than straight percent calculation to make assessment. Error rate was 0.25.
2014	3594	Williams Cr.	pH	WQS attained; new assessment method	used binomial probability error rate for large sample size instead of straight 10 percent.
2014	2375	Wilson's Cr.	Aquatic Macroinvertebrate Bioassessments	Status unknown - Orig listing in error	Needs to be Re-assessed based on small candidate reference stream scores, not wadeable reference scores.

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APPENDIX C

TMDL Schedule and Section 303(d) Prioritization

Tentative Schedule for the Completion of Total Maximum Daily Load Studies.

TMDL Schedule FFY	Water Body Name	WBID	Class	Impaired Segment Size (mi/acres)	Classified Segment Size (mi/acres)	County	Pollutant	Impaired Uses
2015	Antire Cr.	2188	P	1.9	1.9	St. Louis	Escherichia coli	WBC-B
2018	Antire Cr.	2188	P	1.9	1.9	St. Louis	pH (W)	AQL
2017	Bass Cr.	0752	C	4.4	4.4	Boone	Escherichia coli	WBC-A
2016	Baynham Br.	3240	P	4	4	Newton	Escherichia coli	WBC-B
2020	Bee Fork	2760	C	1.4	8.7	Reynolds	Lead (W)	AQL
2024	Bee Tree Lake	7309	L3	10.0	10.0	St. Louis	Mercury (T)	AQL
2024	Beef Br.	3224	P	2.5	2.5	Newton	Zinc (W)	AQL
2024	Beef Br.	3224	P	2.5	2.5	Newton	Cadmium (W)	AQL
2024	Beef Br.	3224	P	2.5	2.5	Newton	Cadmium (S)	AQL
2024	Beef Br.	3224	P	2.5	2.5	Newton	Lead (S)	AQL
2024	Beef Br.	3224	P	2.5	2.5	Newton	Zinc (S)	AQL
2016	Belcher Branch Lake	7365	L3	55	55	Buchanan	Mercury (T)	AQL
2024	Bens Br.	3980	US	5.8	5.8	Jasper	Cadmium (S)	GEN
2024	Bens Br.	3980	US	5.8	5.8	Jasper	Lead (S)	GEN
2024	Bens Br.	3980	US	5.8	5.8	Jasper	Zinc (S)	GEN
2017	Big Creek	1250	P	70.5	70.5	Jackson/Henry	Escherichia coli	WBC-B
2022	Big Creek	0444	P	1	22	Harrison	Ammonia	AQL
2022	Big Creek	0444	P	6	22	Harrison	Oxygen, Dissolved	AQL
2024	Big Creek	2916	P	3	34.1	Wayne/Iron	Cadmium (S)	AQL
2024	Big Creek	2916	P	3	34.1	Wayne/Iron	Lead (S)	AQL
2024	Big Piney River	1578	P	4	8	Texas	Oxygen, Dissolved	AQL
2015	Big R.	2080	P	52.3	81.3	St. Francois/Jefferson	Lead (S)	AQL
2015	Big R.	2080	P	18.6	68	St. Francois	Cadmium (S)	AQL
2015	Black Cr.	0111	C	19.4	19.4	Shelby	Escherichia coli	WBC B
2015	Black Cr.	3825	P	1.6	1.6	St. Louis	Escherichia coli	SCR, WBC B
2018	Black Cr.	3825	P	1.6	1.6	St. Louis	Chloride	AQL
2025	Black Cr.	0111	C	19.4	19.4	Shelby	Oxygen, Dissolved	AQL
2016	Black River	2784	P	39	39	Wayne/Butler	Mercury (T)	AQL
2016	Black River	2769	P	47.1	47.1	Butler	Mercury (T)	AQL
2016	Blackberry Creek	3184	C	3.5	6.5	Jasper	Chloride	AQL
2016	Blackberry Creek	3184	C	3.5	6.5	Jasper	Total Dissolved Solids	AQL

TMDL Schedule FFY	Water Body Name	WBID	Class	Impaired Segment Size (mi/acres)	Classified Segment Size (mi/acres)	County	Pollutant	Impaired Uses
2014	Blue River	0417	P	4.4	4.4	Jackson	Escherichia coli	WBC-B
2014	Blue River	0418	P	9.4	9.4	Jackson	Escherichia coli	WBC-B
2014	Blue River	0419	P	7.7	7.7	Jackson	Escherichia coli	WBC-A
2014	Blue River	0421	C	12	12	Jackson	Escherichia coli	WBC-B
2015	Bonhomme Cr.	1701	C	2.5	2.5	St. Louis	Escherichia coli	WBC-B
2018	Bonhomme Cr.	1701	C	2.5	2.5	St. Louis	pH	AQL
2017	Bonne Femme Creek	0750	P	7.8	7.8	Boone	Escherichia coli	WBC-A
2017	Bonne Femme Creek	0753	C	7	7	Boone	Escherichia coli	WBC-B
2016	Bourbeuse River	2034	P	136.7	136.7	Phelps/Franklin	Mercury (T)	AQL
2017	Bowling Green (Old) Lake	7003	L1	28.2	28.2	Pike	Nitrogen, Total	AQL
2017	Bowling Green (Old) Lake	7003	L1	28.2	28.2	Pike	Phosphorus, Total	AQL
2024	Bowling Green (Old) Lake	7003	L1	7.0	7.0	Pike	Chlorophyll-a (W)	AQL
2021	Brazeau Cr.	1796	P	10.8	10.8	Perry	Escherichia coli	WBC B
2019	Brush Creek	1371	P	4.7	4.7	Polk/St. Clair	Oxygen, Dissolved	AQL
2023	Buffalo Cr.	3273	P	8	8	Newton/McDonald	Fishes Bioassessments/Unknown	AQL
2017	Burgher Branch	1865	C	2	2	Phelps	Oxygen, Dissolved	AQL
2016	Busch Lake #35	7057	L3	51	51	St. Charles	Mercury (T)	AQL
2016	Busch Lake #37	7627	U	34	34	St. Charles	Mercury (T)	GEN
2016	Capps Creek	3234	P	5	5	Barry	Escherichia coli	WBC-A
2015	Castor River	2288	P	7.5	7.5	Bollinger	Escherichia coli	WBC-A
2021	Cedar Creek	737	C	7.9	37.4	Boone	Aquatic Macroinvertebrate Bioassessments/Unknown	AQL
2022	Cedar Creek	1344	P	10	31	Cedar	Oxygen, Dissolved	AQL
2022	Cedar Creek	1357	C	16.2	16.2	Cedar	Oxygen, Dissolved	AQL
2023	Cedar Creek	1344	P	10	31	Cedar	Aquatic Macroinvertebrate Bioassessments/Unknown	AQL
2023	Cedar Creek	1357	C	16.2	16.2	Cedar	Aquatic Macroinvertebrate Bioassessments/Unknown	AQL
2024	Center Cr.	3203	P	26.8	26.8	Jasper	Escherichia coli	WBC A
2014	Center Creek	3214	P	4.9	4.9	Lawrence/Newton	Escherichia coli	WBC A
2014	Center Creek	3210	P	21	21	Newton/Jasper	Escherichia coli	WBC A
2019	Center Creek	3203	P	19	26.8	Jasper	Cadmium (S)	AQL
2019	Center Creek	3203	P	19	26.8	Jasper	Cadmium (W)	AQL
2019	Center Creek	3203	P	19	26.8	Jasper	Lead (S)	AQL
2024	Chaumiere Lake	7634	UL	3.4	3.4	Clay	Mercury (T)	GEN

TMDL Schedule FFY	Water Body Name	WBID	Class	Impaired Segment Size (mi/acres)	Classified Segment Size (mi/acres)	County	Pollutant	Impaired Uses
2021	Cinques Hommes Cr.	1781	C	8.3	17.1	Perry	Escherichia coli	WBC-B
2016	Clear Creek	3238	P	11.1	11.1	Barry/Newton	Escherichia coli	WBC-B
2019	Clear Creek	3239	C	3.5	3.5	Barry/Newton	Nutrient/Eutroph. Biol. indicators	AQL
2019	Clear Creek	3239	C	3.5	3.5	Barry/Newton	Oxygen, Dissolved	AQL
2022	Clear Creek	1336	C	15	15	Vernon	Oxygen, Dissolved	AQL
2022	Clear Creek	1333	P	15.5	15.5	Vernon/St. Clair	Oxygen, Dissolved	AQL
2018	Clear Fk.	935	P	3.1	25.8	Johnson	Oxygen, Dissolved	AQL
2016	Clearwater Lake	7326	L2	1635	1635	Reynolds/Wayne	Mercury (T)	AQL
2024	Clearwater Lake	7326	L2	1635.0	1635.0	Wayne	Chlorophyll-a (W)	AQL
2014	Coldwater Creek	1706	C	5.5	5.5	St. Louis	Escherichia coli	WBC B
2018	Coldwater Creek	1706	C	5.5	5.5	St. Louis	Chloride	AQL
2026	Coonville Cr.	2177	C	1.3	1.3	St. Francois	Lead (W)	AQL
2026	Courtois Creek	1943	P	2.6	32	Washington	Lead (S)	AQL
2026	Courtois Creek	1943	P	2.6	32	Washington	Zinc (S)	AQL
2023	Crane Cr.	2382	P	13.2	13.2	Stone	Aquatic Macroinvertebrate Bioassessments/Unknown	AQL
2024	Craven Ditch	2816	C	11.6	11.6	Butler	Oxygen, Dissolved	AQL
2014	Creve Coeur Creek	1703	C	3.8	3.8	St. Louis	Escherichia coli	WBC B
2018	Creve Coeur Creek	1703	C	3.8	3.8	St. Louis	Chloride	AQL
2019	Creve Coeur Creek	1703	C	3.8	3.8	St. Louis	Oxygen, Dissolved	AQL
2020	Crooked Creek	1928	P	3.5	3.5	Dent/Crawford	Cadmium (S)	AQL
2020	Crooked Creek	1928	P	3.5	3.5	Dent/Crawford	Cadmium (W)	AQL
2020	Crooked Creek	3961	U	5.2	n/a	Iron/Dent	Cadmium (W)	GEN
2020	Crooked Creek	3961	U	5.2	n/a	Iron/Dent	Copper (W)	GEN
2020	Crooked Creek	1928	P	3.5	3.5	Dent/Crawford	Lead (S)	AQL
2016	Current River	2636	P	124	124	Shannon/Ripley	Mercury (T)	AQL
2016	Dardenne Creek	0221	P	16.5	16.5	St. Charles	Sedimentation/Siltation	AQL
2020	Dardenne Creek	0221	P	16.5	16.5	St. Charles	Aquatic Macroinvertebrate Bioassessments/Unknown	AQL
2024	Dardenne Creek	0221	P	16.5	16.5	St. Charles	Oxygen, Dissolved	AQL
2015	Deer Cr.	3826	P	1.6	1.6	St. Louis	Escherichia coli	SCR, WBC A
2018	Deer Cr.	3826	P	1.6	1.6	St. Louis	Chloride	AQL
2016	Deer Ridge Lake	7015	L3	48	48	Lewis	Mercury (T)	AQL
2021	Ditch #36	3109	P	7	7	Dunklin	Oxygen, Dissolved	AQL
2019	Douger Br.	3810	C	3.1	3.1	Lawrence	Lead (S)	AQL
2019	Douger Br.	3810	C	3.1	3.1	Lawrence	Zinc (S)	AQL
2019	Dousinbury Creek	1180	P	3.5	3.5	Dallas	Escherichia coli	WBC B

TMDL Schedule FFY	Water Body Name	WBID	Class	Impaired Segment Size (mi/acres)	Classified Segment Size (mi/acres)	County	Pollutant	Impaired Uses
2014	Dry Fork	3189	C	10.2	10.2	Jasper	Escherichia coli	WBC A
2024	Drywood Cr.	1314	P	3.8	29.9	Barton	Total Dissolved Solids	AQL
2017	Dutro Carter Creek	3569	P	0.6	1.5	Phelps	Oxygen, Dissolved	AQL
2024	East Fork Crooked River	0372	P	14	14	Ray	Oxygen, Dissolved	AQL
2016	East Fork Grand River	0457	P	25	25	Worth/Gentry	Escherichia coli	WBC A
2014	East Fork Locust Creek	0608	P	13	13	Sullivan	Escherichia coli	WBC B
2014	East Fork Locust Creek	0610	C	0.4	13	Sullivan	Escherichia coli	WBC B
2019	East Fork Locust Creek	0610	C	12.6	13	Sullivan	Oxygen, Dissolved	AQL
2021	East Fork Tebo Creek	1282	C	10.4	14.5	Henry	Oxygen, Dissolved	AQL
2015	Eaton Branch	2166	C	0.9	1.2	St. Francois	Cadmium (S)	AQL
2015	Eaton Branch	2166	C	0.9	1.2	St. Francois	Cadmium (W)	AQL
2015	Eaton Branch	2166	C	0.9	1.2	St. Francois	Lead (S)	AQL
2015	Eaton Branch	2166	C	0.9	1.2	St. Francois	Zinc (S)	AQL
2015	Eaton Branch	2166	C	0.9	1.2	St. Francois	Zinc (W)	AQL
2016	Eleven Point River	2597	P	11.4	11.4	Oregon	Mercury (T)	AQL
2016	Eleven Point River	2601	P	22.3	22.3	Oregon	Mercury (T)	AQL
2016	Eleven Point River	2593	P	22.7	22.7	Oregon	Mercury (T)	AQL
2021	Elm Branch	1283	C	3	3	Henry	Oxygen, Dissolved	AQL
2015	Fee Fee (new) Cr.	1704	P	1.5	1.5	St. Louis	Escherichia coli	WBC B
2018	Fee Fee (new) Cr.	1704	P	1.5	1.5	St. Louis	Chloride	AQL
2016	Fellows Lake	7237	L1	800.0	800	Greene	Mercury (T)	AQL
2015	Fenton Cr.	3595	P	0.5	0.5	St. Louis	Escherichia coli	WBC B
2014	Fishpot Creek	2186	P	2	2	St. Louis	Escherichia coli	WBC B
2018	Fishpot Creek	2186	P	2	2	St. Louis	Chloride	AQL
2015	Flat River Creek	2168	C	5	9	St. Francois	Cadmium (W)	AQL
2018	Forest Lake	7151	L1	573	573	Adair	Chlorophyll	AQL
2018	Forest Lake	7151	L1	573	573	Adair	Nitrogen	AQL
2018	Forest Lake	7151	L1	573	573	Adair	Phosphorus	AQL
2021	Fowler Creek	0747	C	6	6	Boone	Oxygen, Dissolved	AQL
2023	Fox Cr.	1842	P	7.2	7.2	St. Louis	Aquatic Macroinvertebrate Bioassessments/Unknown	AQL
2016	Fox River	0038	P	42	42	Clark	Escherichia coli	WBC B
2017	Fox Valley Lake	7008	L3	89	89	Clark	Phosphorus	AQL
2024	Fox Valley Lake	7008	L3	89.0	89.0	Clark	Chlorophyll-a (W)	AQL
2024	Fox Valley Lake	7008	L3	89.0	89.0	Clark	Nitrogen, Total (W)	AQL
2016	Foxboro Lake	7382	L3	22	22	Franklin	Mercury (T)	AQL
2016	Frisco Lake	7280	L3	5	5	Phelps	Mercury (T)	AQL

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2017	Gans Cr.	1004	C	5.5	5.5	Boone	Escherichia coli	WBC-A
2016	Gasconade River	1455	P	249	249	Gasconade/Wright	Mercury (T)	AQL
2015	Grand Glaize Cr.	2184	C	4.0	4.0	St. Louis	Escherichia coli (W)	WBC B
2016	Grand Glaize Creek	2184	C	4	4	St. Louis	Mercury (T)	AQL
2018	Grand Glaize Creek	2184	C	4	4	St. Louis	Chloride	AQL
2014	Grand River	0593	P	60	60	Livingston/Chariton	Escherichia coli	SCR, WBC A
2016	Gravois Creek	1712	P	2	2	St. Louis	Escherichia coli	WBC B
2016	Gravois Creek	1713	C	4	4	St. Louis	Escherichia coli	WBC B
2018	Gravois Creek	1712	P	2	2	St. Louis	Chloride	AQL
2018	Gravois Creek	1713	C	4	4	St. Louis	Chloride	AQL
2017	Grindstone Creek	1009	C	1.5	2.5	Boone	Escherichia coli	WBC A
2024	Harrison County Lake	7386	L1	280.0	280.0	Harrison	Mercury (T)	AQL
2016	Hazel Creek Lake	7152	L1	151	151	Adair	Mercury (T)	AQL
2017	Hazel Creek Lake	7152	L1	151	151	Adair	Chlorophyll	AQL
2022	Heath's Cr.	0848	P	21	21	Pettis	Oxygen, Dissolved	AQL
2024	Hickory Br.	596	C	6.8	6.8	Chariton	Oxygen, Dissolved	AQL
2016	Hickory Cr.	3226	P	4.9	4.9	Newton	Escherichia coli	WBC A
2017	Hinkson Cr.	1008	C	18	18	Boone	Escherichia coli	WBC B
2017	Hominy Br.	1011	C	1	1	Boone	Escherichia coli	WBC B
2014	Honey Cr.	3169	P	16.5	16.5	Lawrence	Escherichia coli	WBC B
2014	Honey Cr.	3170	C	2.7	2.7	Lawrence	Escherichia coli	WBC B
2022	Horse Cr.	1348	P	27.7	27.7	Cedar	Oxygen, Dissolved	AQL
2023	Horse Cr.	1348	P	27.7	27.7	Cedar	Aquatic Macroinvertebrate Bioassessments/Unknown	AQL
2024	Horseshoe Cr.	3413	C	5.8	5.8	Lafayette/Jackson	Oxygen, Dissolved	AQL
2016	Hough Park Lake	7388	L3	7	7	Cole	Mercury (T)	AQL
2016	Hunnewell Lake	7029	L3	228	228	Shelby	Mercury (T)	AQL
2014	Indian Cr.	0420	C	3	3	Jackson	Escherichia coli	WBC A
2016	Indian Cr.	3256	P	9.7	30.8	Newton/McDonald	Escherichia coli	WBC A
2024	Indian Cr.	0420	C	3	3	Jackson	Chloride	AQL
2026	Indian Cr.	1946	P	1.9	1.9	Washington	Lead (S)	AQL
2026	Indian Cr.	1946	P	1.9	1.9	Washington	Zinc (S)	AQL
2016	Indian Creek Lake	7389	L3	192	192	Livingston	Mercury (T)	AQL
2024	Jacobs Br.	3223	P	1.6	1.6	Newton	Cadmium (W)	AQL
2024	Jacobs Br.	3223	P	1.6	1.6	Newton	Cadmium (S)	AQL
2024	Jacobs Br.	3223	P	1.6	1.6	Newton	Lead (S)	AQL
2024	Jacobs Br.	3223	P	1.6	1.6	Newton	Zinc (S)	AQL

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2026	Jacobs Br.	3223	P	1.6	1.6	Newton	Zinc (W)	AQL
2016	Jenkins Cr.	3207	P	2.8	2.8	Newton/Jasper	Escherichia coli	WBC A
2024	Jenkins Cr.	3208	C	4.8	4.8	Newton/Jasper	Escherichia coli	WBC A
2016	Jones Cr.	3205	P	7.5	7.5	Newton/Jasper	Escherichia coli	WBC A
2014	Kiefer Cr.	3592	P	1.2	1.2	St. Louis	Escherichia coli	WBC B
2018	Kiefer Cr.	3592	P	1.2	1.2	St. Louis	Chloride	AQL
2024	L. Beaver Cr.	1529	C	3.5	3.5	Phelps	Escherichia coli	WBC A
2024	L. St. Francis R.	2854	P	24.2	32.4	Madison	Lead (S)	AQL
2016	Lake Buteo	7469	L3	7.0	7.0	Johnson	Mercury (T)	AQL
2016	Lake of the Woods	7436	L3	3	3	Boone	Mercury (T)	AQL
2016	Lake of the Woods	7629	U	7	7	Jackson	Mercury (T)	GEN
2016	Lake St. Louis	7054	L3	525	525	St. Charles	Mercury (T)	AQL
2024	Lake Ste. Louise	7055	L3	71.0	71.0	St. Charles	Mercury (T)	AQL
2016	Lake Winnebago	7212	L3	350	350	Cass	Mercury (T)	AQL
2017	Lamine R.	0847	P	54	54	Morgan/Cooper	Escherichia coli	WBC A
2021	Lat. #2 Main Ditch	3105	P	11.5	11.5	Stoddard	Oxygen, Dissolved	AQL
2021	Lat. #2 Main Ditch	3105	P	11.5	11.5	Stoddard	Temperature (W)	AQL
2021	Lee Rowe Ditch	3137	C	2.3	6	Mississippi	Oxygen, Dissolved	AQL
2015	Lewistown Lake	7020	L1	29	29	Lewis	Atrazine	DWS
2019	Line Cr.	3575	C	7	7	Platte	Escherichia coli	WBC B
2018	Little Beaver Cr.	1529	C	3.4	3.5	Phelps	Sedimentation/Siltation	AQL
2015	Little Blue R.	0422	P	35.1	35.1	Jackson	Escherichia coli	WBC B
2017	Little Bonne Femme Cr.	1003	P	9	9	Boone	Escherichia coli	WBC B
2021	Little Dry Fk.	1863	P	1	5	Phelps	Oxygen, Dissolved	AQL
2021	Little Dry Fk.	1864	C	0.6	4.5	Phelps	Oxygen, Dissolved	AQL
2021	Little Dry Fk.	1864	C	3.9	4.5	Phelps	Oxygen, Dissolved	AQL
2021	Little Drywood Cr.	1326	C	10	10	Barton/Vernon	Oxygen, Dissolved	AQL
2022	Little Drywood Cr.	1325	P	17	17	Vernon	Oxygen, Dissolved	AQL
2016	Little Lost Cr.	3279	P	5.8	5.8	Newton	Escherichia coli	WBC B
2014	Little Medicine Cr.	0623	P	20	40	Mercer/Grundy	Escherichia coli	WBC B
2023	Little Medicine Cr.	0623	P	40	40	Mercer/Grundy	Aquatic Macroinvertebrate Bioassessments/Unknown	AQL
2021	Little Niangua R.	1189	P	20	43	Dallas/Camden	Oxygen, Dissolved	AQL
2017	Little Osage R.	3652	C	16	16	Vernon	Escherichia coli	WBC B
2023	Little Whitewater R.	2229	P	24.2	24.2	Cape G/Bollinger	Aquatic Macroinvertebrate Bioassessments/Unknown	AQL
2014	Locust Cr.	0606	P	36.4	84	Putnam/Sullivan	Escherichia coli	SCR, WBC B

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2026	Logan Cr.	2763	P	6.1	36.0	Reynolds	Lead (S)	AQL
2021	Long Branch Cr.	0696	C	2	13	Macon	Oxygen, Dissolved	AQL
2016	Longview Lake	7097	L2	930	930	Jackson	Mercury (T)	AQL
2016	Lost Cr.	3278	P	8.5	8.5	Newton	Escherichia coli	WBC A
2020	M. Fk. Salt R.	123	C	11.4	25.4	Macon	Oxygen, Dissolved (W)	AQL
2020	Main Ditch	2814	C	13	13.0	Butler	pH	AQL
2020	Main Ditch	2814	C	13	13.0	Butler	Temperature (W)	AQL
2015	Maline Cr.	1709	C	0.6	0.6	St. Louis	Escherichia coli	WBC B
2018	Maline Cr.	3839	C	0.5	0.5	St. Louis	Chloride	AQL
2021	Maple Slough Ditch	3140	C	16	16	Miss/New Madrid	Oxygen, Dissolved	AQL
2016	Mark Twain Lake	7033	L2	18600	18600	Monroe/Ralls	Mercury (T)	AQL
2024	Mattese Cr.	3596	P	1.1	1.1	St. Louis	Chloride (W)	AQL
2024	Mattese Cr.	3596	P	1.1	1.1	St. Louis	Escherichia coli	WBC B
2014	Medicine Cr.	619	P	36	36	Putnam/Grundy	Escherichia coli	WBC B
2015	Meramec R.	2183	P	22	22	St. Louis	Lead (S)	AQL
2015	Meramec R.	2185	P	15.7	26	St. Louis	Lead (S)	AQL
2021	Miami Cr.	1299	P	18	18	Bates	Oxygen, Dissolved	AQL
2016	Middle Fk. Grand R.	468	P	25	25	Worth/Gentry	Escherichia coli	WBC A
2016	Middle Indian Cr.	3263	P	2.2	2.2	Newton	Escherichia coli	WBC B
2023	Middle Indian Cr.	3262	C	3.5	3.5	Newton	Aquatic Macroinvertebrate Bioassessments/Unknown	AQL
2023	Middle Indian Cr.	3263	P	2.2	2.2	Newton	Aquatic Macroinvertebrate Bioassessments/Unknown	AQL
2024	Mississippi R.	1707.03	P	44.6	44.6	St. Louis/Ste. Genevieve	Escherichia coli	WBC B
2025	Missouri R.	0226	P	179	179	Atchison/Jackson	Escherichia coli	WBC B
2025	Missouri R.	1604	P	100	100	Gasconade/St. Charles	Escherichia coli	WBC B
2025	Missouri R.	0356	P	129	129	Jackson/Saline	Escherichia coli	SCR, WBC B
2024	Monroe City Lake	7031	L1	94.0	94.0	Ralls	Mercury (T)	AQL
2016	Mozingo Lake	7402	L1	1000	1000	Nodaway	Mercury (T)	AQL
2023	Muddy Cr.	0853	P	1.8	1.8	Pettis	Aquatic Macroinvertebrate Bioassessments/Unknown	AQL
2017	Mussel Fork Cr.	0674	C	29	29	Sullivan/Macon	Escherichia coli	WBC B
2017	Niangua R.	1170	P	51	51	Webster/Dallas	Escherichia coli	WBC A
2024	Nishnabotna R.	0227	P	10.2	10.2	Atchison	Escherichia coli	WBC B
2016	No Cr.	0550	P	22.5	22.5	Grundy/Livin.	Escherichia coli	WBC B
2024	No Cr.	0550	P	22.5	22.5	Grundy/Livin.	Oxygen, Dissolved	AQL

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2016	Noblett Lake	7316	L3	26	26	Douglas	Mercury (T)	AQL
2024	Noblett Lake	7316	L3	26.0	26.0	Douglas	Chlorophyll-a (W)	AQL
2024	Noblett Lake	7316	L3	26.0	26.0	Douglas	Phosphorus, Total (W)	AQL
2019	Nodaway R.	0279	P	60	60	Nodaway	Escherichia coli	WBC B
2016	North Bethany Lake	7109	L3	78	78	Harrison	Mercury (T)	AQL
2021	North Fk. Cuivre R.	0170	C	8	8	Pike	Fecal coliform	WBC B
2014	North Fk. Spring R.	3186	P	17.4	17.4	Barton	Escherichia coli	WBC B
2014	North Fk. Spring R.	3188	C	55.9	55.9	Dade/Jasper	Escherichia coli	WBC B
2021	North Fk. Spring R.	3188	C	1.1	55.9	Barton	Ammonia, Total	AQL
2021	North Fk. Spring R.	3188	C	55.9	55.9	Dade/Jasper	Oxygen, Dissolved	AQL
2016	North Indian Cr.	3260	P	5	5	Newton	Escherichia coli	WBC B
2023	North Indian Cr.	3260	P	5.2	5.2	Newton	Aquatic Macroinvertebrate Bioassessments/Unknown	AQL
2022	Osage R.	1293	P	39.3	39.3	Vernon/St.Clair	Oxygen, Dissolved	***
2022	Panther Cr.	1373	C	7.8	7.8	St.Clair/Polk	Oxygen, Dissolved	AQL
2016	Pearson Cr.	2373	P	8.0	8.0	Greene	Escherichia coli (W)	WBC A
2016	Perry Phillips Lake	7628	U	32	32	Boone	Mercury (T)	GEN
2018	Peruque Cr.	0217	P	4	4	St. Charles	Fishes Bioassessments/Unknown	AQL
2018	Peruque Cr.	0218	C	8	10.9	St. Charles	Inorganic sediment	AQL
2023	Peruque Cr.	0216	P	0.3	10.3	St. Charles	Fishes Bioassessments/Unknown	AQL
2025	Peruque Cr.	0215	P1	9.6	9.6	St. Charles	Oxygen, Dissolved	AQL
2025	Pickle Cr.	1755	P	7	7	Ste. Genevieve	pH	AQL
2024	Pike Cr.	2815	C	6	6.0	Butler	Oxygen, Dissolved	AQL
2019	Platte R.	0312	P	138	138	Worth/Platte	Escherichia coli	WBC B
2022	Pleasant Run Cr.	1327	C	7.6	7.6	Vernon	Oxygen, Dissolved	AQL
2021	Pole Cat Slough	3120	P	12	12	Dunklin	Oxygen, Dissolved	AQL
2024	Pole Cat Slough	3120	P	12.6	12.6	Dunklin	Temperature (W)	AQL
2024	Pomme de Terre R.	1440	P	69.1	69.1	Webster/Polk	Escherichia coli	WBC A
2022	Red Oak Cr.	2038	C	10	10	Gasconade	Oxygen, Dissolved	AQL
2017	River des Peres	1710	C	2.6	2.6	St. Louis	Escherichia coli	SCR
2018	River des Peres	1710	P	2.6	2.6	St. Louis City	Oxygen, Dissolved	AQL
2018	River des Peres	1710	C	2.6	2.6	St. Louis	Chloride	AQL
2018	River des Peres	3972	U	6.5	6.5	St. Louis	Chloride	GEN
2024	Salt Cr.	0594	C	14	14.0	Livin./Chariton	Oxygen, Dissolved	AQL
2024	Salt Fk.	0893	P	13.3	26.7	Saline	Oxygen, Dissolved	AQL
2023	Salt Pine Creek	2113	C	1.2	1.2	St. Francois	Aquatic Macroinvertebrate Bioassessments/Unknown	AQL

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2016	Salt R.	0103	P1	9.3	9.3	Ralls	Mercury (T)	AQL
2022	Salt R.	0091	P	29	29	Ralls/Pike	Oxygen, Dissolved	AQL
2024	Salt R.[1]	0103	P1	9.3	9.3	Ralls	Oxygen, Dissolved	AQL
2024	Shibboleth Br.	2119	P	1.0	1.0	Washington	Lead (S)	AQL
2024	Shibboleth Br.	2119	P	1.0	1.0	Washington	Zinc (S)	AQL
2016	Shoal Cr.	3222	P	41.1	41.1	Newton	Escherichia coli	WBC A
2024	Slater Br.	3754	C	3.7	3.7	Jasper	Escherichia coli	WBC B
2021	Sni-a-bar Cr.	0399	P	32	32	Jackson/Lafayette	Oxygen, Dissolved	AQL
2018	South Blackbird Cr.	0655	C	5	13	Putnam	Ammonia	AQL
2019	South Fabius R.	0071	P	80.6	80.6	Knox/Marion	Escherichia coli	WBC B
2019	South Fk. Salt R.	0142	C	20.1	32	Callaway/Audrain	Oxygen, Dissolved	AQL
2017	South Grand R.	1249	P	62.5	62.5	Cass/Henry	Escherichia coli	WBC B
2016	South Indian Cr.	3259	P	8.7	8.7	Newton/McDonald	Escherichia coli	WBC B
2023	South Indian Cr.	3259	P	8.7	8.7	McDonald/Newton	Aquatic Macroinvertebrate Bioassessments/Unknown	AQL
2024	Spencer Cr.	0224	C	1.5	1.5	St. Charles	Chloride	AQL
2014	Spring R.	3164	P	8.8	8.8	Lawrence	Escherichia coli	WBC A
2014	Spring R.	3165	P	11.9	11.9	Lawrence	Escherichia coli	WBC A
2014	Spring R.	3160	C	61.7	61.7	Lawrence/Jasper	Escherichia coli	WBC A
2026	St. Francis R.	2835	P	8.4	93.1	St. Francois	Temperature, water	CLF
2016	St. John's Ditch	3138	P	15.3	15.3	New Madrid	Mercury (T)	AQL
2018	St. John's Ditch	3138	P	15.3	15.3	New Madrid	Escherichia coli	WBC B
2021	Stevenson Bayou	3135	C	14	14	Mississippi	Oxygen, Dissolved	AQL
2022	Straight Fk.	0959	C	2.5	6	Morgan	Oxygen, Dissolved	AQL
2020	Strother Cr.	3965	U	0.9	n/a	Reynolds/Iron	Arsenic (S)	GEN
2020	Strother Cr.	2751	P	6	6.0	Iron	Lead (S)	AQL
2020	Strother Cr.	3965	U	0.9	n/a	Reynolds/Iron	Lead (S)	GEN
2020	Strother Cr.	2751	P	6	6.0	Iron	Lead (W)	AQL
2020	Strother Cr.	2751	P	6	6.0	Iron	Nickel (S)	AQL
2020	Strother Cr.	3965	U	0.9	n/a	Reynolds/Iron	Nickel (S)	GEN
2020	Strother Cr.	2751	P	6	6.0	Iron	Zinc (S)	AQL
2020	Strother Cr.	3965	U	0.9	n/a	Reynolds/Iron	Zinc (S)	GEN
2020	Strother Cr.	2751	P	6	6.0	Iron	Zinc (W)	AQL
2020	Strother Cr.	3965	U	0.9	n/a	Reynolds/Iron	Zinc (W)	GEN
2024	Strother Cr.	2751	P	6.0	6.0	Iron/Reynolds	Aquatic Macroinvertebrate Bioassessments/Unknown	AQL
2022	Sugar Cr.	0686	P	6.8	6.8	Randolph	Oxygen, Dissolved	AQL

TMDL Schedule FFY	Water Body Name	WBID	Class	Impaired Segment Size (mi/acres)	Classified Segment Size (mi/acres)	County	Pollutant	Impaired Uses
2024	Sugar Creek Lake	7166	L1	308.0	308.0	Randolph	Mercury (T)	AQL
2016	Sunset Lake	7399	L3	6	6	Cole	Mercury (T)	AQL
2017	Table Rock Lake	7313	L2	41747.0	41747.0	Taney	Nutrient/Eutrophication Biol. Indicators (W)*	AQL
2017	Table Rock Lake, White River Arm	7313	L2	17240	17240	Barry/Taney	Chlorophyll	AQL
2017	Table Rock Lake, White River Arm	7313	L2	17240	17240	Barry/Taney	Nitrogen	AQL
2017	Terre Du Lac Lakes (Lac Capri)	7297	L3	103	103	St. Francois	Chlorophyll-a	AQL
2017	Terre Du Lac Lakes (Lac Capri)	7297	L3	103	103	St. Francois	Nitrogen, Total	AQL
2016	Thompson R.	0549	P	5	65	Harrison	Escherichia coli	WBC B
2016	Thurman Cr.	3243	P	3	3	Newton	Escherichia coli	WBC B
2019	Trib. to Chat Creek	3963	U	0.9	0.9	Lawrence	Cadmium (W)	GEN
2019	Trib. to Chat Creek	3963	U	0.9	0.9	Lawrence	Zinc (W)	GEN
2024	Trib. to Coon Cr.	0133	C	1	1	Randolph	Oxygen, Dissolved	AQL
2015	Trib. to Flat River Creek	3938	U	0.3	0.3	St. Francois	Zinc (W)	AQL
2020	Trib. to Goose Creek	1420	C	3	3	Lawrence	Escherichia coli	WBC B
2019	Trib. To Little Muddy Cr.	3490	C	1	1	Pettis	Chloride	AQL
2015	Trib. To Old Mines Cr.	2114	C	1.5	1.5	St. Francois	Sedimentation/Siltation	GEN
2022	Trib. To Red Oak Cr.	3360	C	0.5	0.5	Gasconade	Oxygen, Dissolved	AQL
2022	Trib. To Red Oak Cr.	3361	C	1.9	1.9	Gasconade	Oxygen, Dissolved	AQL
2024	Trib. to Shoal Cr.	3981	US	1.6	1.6	Jasper/Newton	Cadmium (W)	GEN
2024	Trib. to Shoal Cr.	3981	US	1.6	1.6	Jasper/Newton	Zinc (W)	GEN
2024	Trib. to Shoal Cr.	3982	US	2.2	2.2	Jasper/Newton	Zinc (W)	GEN
2024	Trib. to Turkey Cr.	3983	US	2.9	2.9	Jasper	Cadmium (S)	GEN
2024	Trib. to Turkey Cr.	3983	US	2.9	2.9	Jasper	Lead (S)	GEN
2024	Trib. to Turkey Cr.	3983	US	2.9	2.9	Jasper	Zinc (S)	GEN
2024	Trib. to Turkey Cr.	3983	US	2.9	2.9	Jasper	Zinc (W)	GEN
2024	Trib. to Turkey Cr.	3984	US	2.2	2.2	Jasper	Zinc (W)	GEN
2024	Trib. to Turkey Cr.	3985	US	1.6	1.6	Jasper	Zinc (W)	GEN
2022	Trib. To Willow Fk.	956	C	0.5	0.5	Moniteau	Oxygen, Dissolved	AQL
2019	Trib. To Wolf Cr.	3589	C	1.5	1.5	St. Francois	Oxygen, Dissolved	AQL
2021	Troublesome Cr.	0074	C	6.1	41.3	Knox	Oxygen, Dissolved	AQL
2014	Truitt Cr.	3175	C	6.4	6.4	Lawrence	Escherichia coli	WBC B
2014	Turkey Cr.	3216	P	7.7	7.7	Jasper	Escherichia coli	WBC B

TMDL Schedule FFY	Water Body Name	WBID	Class	Impaired Segment Size (mi/acres)	Classified Segment Size (mi/acres)	County	Pollutant	Impaired Uses
2014	Turkey Cr.	3217	P	6.1	6.1	Jasper	Escherichia coli	WBC A
2015	Turkey Cr.	3282	P	2.4	2.4	St. Francois	Cadmium (W)	AQL
2015	Turkey Cr.	3282	P	2.4	2.4	St. Francois	Lead (W)	AQL
2015	Turkey Cr.	3282	P	1.2	2.4	St. Francois	Zinc (W)	AQL
2017	Turkey Cr.	0751	C	6.3	6.3	Boone	Escherichia coli	WBC A
2017	Turkey Cr.	3216	P	7.7	7.7	Jasper	Cadmium (S)	AQL
2017	Turkey Cr.	3217	P	6.1	6.1	Jasper	Cadmium (S)	AQL
2017	Turkey Cr.	3216	P	7.7	7.7	Jasper	Cadmium (W)	AQL
2017	Turkey Cr.	3216	P	7.7	7.7	Jasper	Lead (S)	AQL
2017	Turkey Cr.	3216	P	7.7	7.7	Jasper	Zinc (S)	AQL
2017	Turkey Cr.	3217	P	6.1	6.1	Jasper	Zinc (S)	AQL
2020	Turnback Cr.	1414	P	14	14.0	Lawrence/Dade	Escherichia coli	WBC A
2020	Warm Fk. Spring R.	2579	P	13.8	13.8	Oregon	Fecal Coliform	WBC A
2014	Watkins Cr.	1708	C	3.5	3.5	St. Louis	Escherichia coli	WBC B
2018	Watkins Cr.	1708	C	3.5	3.5	St. Louis	Chloride	AQL
2016	Weatherby Lake	7071	L3	194	194	Platte	Mercury (T)	AQL
2017	Weatherby Lake	7071	L3	194	194	Platte	Chlorophyll-a	AQL
2017	Weatherby Lake	7071	L3	194	194	Platte	Nitrogen, Total	AQL
2024	Weatherby Lake	7071	L3	185.0	185.0	Platte	Phosphorus, Total (W)	AQL
2016	Weldon R.	0560	P	42	42	Mercer/Grundy	Escherichia coli	WBC B
2020	West Fk. Black R.	2755	P	2.1	32.3	Reynolds	Lead (S)	AQL
2020	West Fk. Black R.	2755	P	2.1	32.3	Reynolds	Nickel (S)	AQL
2022	West Fk. Drywood Cr.	1317	C	8.1	8.1	Vernon	Oxygen, Dissolved	AQL
2024	Whetstone Cr.	1504	P	12.2	12.2	Wright	Oxygen, Dissolved	AQL
2014	White Oak Cr.	3182	C	18	18	Lawrence/Jasper	Escherichia coli	WBC A
2015	Wildhorse Cr.	1700	C	3.9	3.9	St. Louis	Escherichia coli	WBC B
2014	Williams Cr.	3171	P	1	1	Lawrence	Escherichia coli	WBC A
2014	Williams Cr.	3172	P	8.5	8.5	Lawrence	Escherichia coli	WBC A
2015	Williams Cr.	3594	P	1	1	St. Louis	Escherichia coli	WBC B
2016	Willow Br.	3280	P	2.2	2.2	Newton	Escherichia coli	WBC B
2024	Willow Br.	3280	P	2.2	2.2	Newton	Cadmium (S)	AQL
2024	Willow Br.	3280	P	2.2	2.2	Newton	Lead (S)	AQL
2024	Willow Br.	3280	P	2.2	2.2	Newton	Zinc (S)	AQL
2022	Willow Fk.	955	C	6.5	6.5	Moniteau	Oxygen, Dissolved	AQL
2016	Wilsons Cr.	2375	P	11.9	14	Greene/Christian	Escherichia coli	WBC B
2024	Woods Fk.	2429	C	5.5	5.5	Christian	Fishes Bioassessments/Unknown	AQL

APPENDIX D

Lake Specific Trophic Data

Site Name	County	Location	Years[1]	Secchi[2]	TP[3]	TN[3]	Chl-a[5]	Trophic[6]
GLACIAL PLAINS								
*Allaman Lake	Clinton	24, 56N, 30W	8	1.2	40	645	15.4	E
Baring C.C. Lake	Knox	26, 63N, 12W	9	1.3	28	938	20.1	E
Bean Lake	Platte	12/14, 54N, 37W	1	0.1	264	1658	144.0	HE
Belcher Branch Lake	Buchanan	8/17,55N,34W	6	1.1	35	577	12.3	E
Bethany Lake #2	Harrison	27, 64N, 28W	11	1.3	33	713	10.6	E
Big Lake	Holt	18/19, 61N, 39W	1	0.2	328	2508	166.0	HE
Bilby Ranch Lake	Nodaway	13/24, 64N, 38W	13	1.0	51	926	34.2	E
Blind Pony Lake	Saline	18, 49N, 22W	17	0.6	95	1310	42.5	E
Bowling Green Lake	Pike	29, 53N, 02W	22	1.9	24	516	7.7	M
Breckenridge City Res.	Caldwell	3, 57N, 26W	2	1.0	64	867	34.1	E
1Brookfield Lake	Linn	33, 58N, 19W	21	1.2	23	633	8.2	M
Bucklin Lake	Linn	11, 57N, 18W	2	0.5	137	1997	18.4	E
Busch W.A. #16	St. Charles	35/36, 46N, 2E	1	1.8	26	594	13.7	E
Busch W.A. #37	St. Charles	27 46N, 3E	3	1.2	28	485	7.3	M
Cameron Lake #3	Dekalb	9, 57N, 30W	2	0.4	138	1196	22.9	E
Cameron Lake #4	Dekalb	8, 57N, 30W	1	0.4	196	1753	22.5	HE
Charity Lake	Atchison	1, 65N, 41W	3	1.5	39	615	16.6	E
Clarence Lake #2	Shelby	15/16,57N,12W	2	0.9	46	846	21.5	E
Crystal Lake	Ray	32, 53N, 29W	2	0.6	82	918	34.0	E
*Daniel Boone Lake	Shelby	31/32, 58N 12W	2	0.2	187	1424	38.0	HE
*Dean Lake	Chariton	3, 54N, 21W	1	0.1	382	2110	5.0	HE
Deer Ridge Comm. Lake	Lewis	18, 62N, 08W	23	1.1	46	799	19.0	E
Edina City Lake	Knox	07, 62N, 11W	12	0.7	72	1291	29.0	E
Edwin A Pape Lake	Lafayette	20, 48N, 24W	12	0.6	83	1078	29.8	E
Ella Ewing Lake	Scotland	21, 64N, 10W	10	0.6	86	1329	34.1	E
Elmwood City Lake	Sullivan	NW 35, 63N, 20W	11	0.8	61	791	19.3	E
Forest Lake	Adair	14, 62N, 16W	23	1.3	25	417	5.8	M
Fox Valley Lake	Clark	27, 66N, 8W	12	1.9	25	659	11.5	M
Green City Lake	Sullivan	16, 63N, 18W	9	0.6	82	1143	31.4	E
Hamilton Lake	Caldwell	15, 57N, 28W	11	0.8	61	968	14.2	E
*Happy Holler Lake	Andrew	8/17, 60N, 34W	3	0.9	70	1049	53.4	E
Harrison County Lake	Harrison	17/30, 65N, 28W	13	0.7	71	1093	42.5	E
Hazel Creek Lake	Adair	31, 64N, 15W	14	1.3	29	608	8.9	M
Henry Sever Lake	Knox	14, 60N, 10W	23	0.9	54	1056	19.0	E
Higginsville Lake	Lafayette	09, 49N, 25W	22	0.6	99	1278	26.7	E
Hunnewell Lake	Shelby	25, 57N, 9W	23	1.0	44	802	20.7	E
*Indian Creek Lake	Livingston	15/27, 59N, 25W	5	1.7	23	630	12.1	M
Jamesport City Lake	Daviess	22, 60N, 26W	2	0.9	114	993	27.8	E
Jamesport Comm. Lake	Daviess	20, 60N, 26W	4	0.4	137	1942	119.8	HE
*Jo Shelby Lake	Linn	36, 57N, 22W	4	0.9	70	1101	40.5	E
King City New Reservoir	Gentry	28, 61N, 32W	3	0.7	74	989	22.4	E
King City Old Reservoir	Gentry	28, 61N, 32W	1	0.3	212	1445	85.6	HE
King Lake	Dekalb	13,60N,32W	7	0.2	213	1794	21.2	HE
Kraut Run Lk (Busch W.A. #33)	St. Charles	23, 46N, 2E	23	0.5	102	1163	66.4	HE
La Plata Lake (New)	Macon	14, 60N, 14W	5	1.2	31	835	15.3	E
La Belle Lake #2	Lewis	16, 61N, 9W	7	0.8	69	1481	47.9	E
Lake Contrary	Buchanan	26/35, 57N, 36W	6	0.3	365	3060	193.7	HE
Lake Marie	Mercer	36, 66N, 24W	10	2.7	15	445	4.2	M
Lake Paho	Mercer	25, 65N, 25W	11	0.8	48	841	14.3	E

Site Name	County	Location	Years[1]	Secchi[2]	TP[3]	TN[3]	Chl-a[5]	Trophic[6]
Lake Showme	Scotland	15, 65N, 12W	3	1.2	40	950	28.1	E
Lake St. Louis	St. Charles	26, 47N, 2E	9	0.5	86	1171	28.7	E
Lake Ste. Louise	St. Charles	27, 47N, 2E	3	1.1	31	513	6.3	M
Lake Viking	Daviess	09, 59N, 28W	23	1.4	27	514	9.1	M
Lake Wakonda	Lewis	13/14, 60N, 6W	6	0.8	95	1186	50.7	E
Lancaster City Lake	Schuyler	23, 66N, 15W	7	0.7	75	964	33.6	E
Lawson City Lake	Ray	31, 54N, 29W	4	0.9	35	934	26.8	E
Limpp Lake	Gentry	29, 61N, 32W	3	0.4	117	1681	79.8	HE
Lincoln Lake	Lincoln	08, 49N, 1E	21	2.3	17	431	5.0	M
Linneus Lake	Linn	36, 59N, 21W	2	0.6	84	951	25.2	E
Little Dixie Lake	Callaway	26, 48N, 11W	24	0.6	66	859	25.2	E
Long Branch Lake	Macon	18, 57N, 14W	23	0.7	53	892	15.9	E
Macon Lake	Macon	17, 57N, 14W	13	0.8	52	890	28.6	E
Maple Leaf Lake	Lafayette	04, 48N, 26W	9	1.1	40	825	21.1	E
Marceline City Lake	Chariton	14, 56N, 19W	14	0.8	110	1166	42.7	E
Marceline Reservoir	Linn	28, 57N, 18W	3	0.7	133	1438	41.4	E
Mark Twain Lake	Ralls	26, 55N, 07W	24	1.1	71	1373	17.9	E
Maysville Lake (N)	Dekalb	4, 58N, 31W	11	0.6	194	1331	47.4	HE
Maysville Lake (SE)	Dekalb	03, 58N, 31W	1	0.9	68	853	26.4	E
Memphis Res.	Scotland	14, 65N, 12W	12	0.6	79	1244	47.4	E
Milan Lake South	Sullivan	02, 62N, 20W	12	1.0	45	688	13.1	E
Monroe City Lake Rte. J	Ralls	34, 56N, 07W	2	0.6	119	1338	26.7	E
Monroe City Lake B	Monroe	30, 56N, 07W	13	0.5	84	1197	36.1	E
Mozingo Lake	Nodaway	13, 64N, 35W	13	1.5	32	817	18.9	E
Nehai Tonkayea Lake	Chariton	11, 55N, 18W	10	1.8	18	418	2.8	M
Nodaway Lake	Nodaway	20, 65N, 35W	13	0.8	45	1009	24.6	E
Old Bethany City Reservoir	Harrison	02, 63N, 28W	1	1.3	34	576	7.3	M
*Old Kings Lake	Lincoln	NW Surv. 1817	1	0.3	278	1573	80.0	HE
*Philips Lake	Boone	32, 58N, 12W	4	1.0	41	714	18.2	E
Pike Lake	Livingston	2, 59N, 25W	2	1.4	29	650	13.5	E
Pine Ridge	Chariton	15, 53N, 17W	1	0.8	63	1258	28.7	E
Pony Express Lake	Dekalb	33, 58N, 31W	12	0.8	67	1057	32.1	E
*Prairie Lake	St. Charles	Surv. 1790	1	0.7	98	790	11.6	E
*Prairie Slough	Lincoln	2/12, 51N, 2E	1	0.2	231	2495	72.0	HE
Ray County Lake	Ray	13, 52N, 28W	4	0.4	163	2026	134.2	HE
Rocky Fork Lake	Boone	31, 50N, 12W	8	1.9	23	546	6.6	M
Rocky Hollow Lake	Clay	33, 53N, 30W	11	1.2	73	866	33.5	E
Rothwell Park Lake	Randolph	SE NE03,53N,14W	3	1.2	52	858	30.0	E
*Santa Fe Lake	Macon	5, 60N, 14W	3	1.1	49	1028	41.8	E
Savannah Lake	Andrew	07,59N,35W	4	1.1	48	936	26.5	E
Sears Community Lake	Sullivan	18,63N,19W	2	1.3	41	671	8.7	E
Shelbina Lake	Shelby	NE SW20,57N,10W	11	0.6	97	1054	37.1	E
Shelbyville Lake	Shelby	SE SE19,58N,10W	1	0.4	160	1587	93.0	HE
Smithville Lake	Clay	E SW13,53N,33W	24	1.0	33	849	17.8	E
Spring Lake	Adair	10,61N,16W	9	1.2	35	533	9.0	E
Sterling Price Lake	Chariton	17,53N,17W	10	0.6	105	1466	78.4	HE
Sugar Creek Lake	Randolph	16, 54N, 14W	10	0.8	55	757	25.5	E
Sugar Lake	Buchanan	16, 54N, 14W	6	0.2	333	2524	173.0	HE
*Swan Pond	Lincoln	Surv. 1732	1	0.3	345	1658	126.0	HE
Thomas Hill Res.	Randolph	24, 55N, 16W	13	0.7	53	773	14.5	E
Thunderhead Lake	Putnam	15, 66N, 19W	12	0.8	50	971	16.7	E
Tobacco Hills Lake	Platte	11, 53N, 35W	2	2.3	22	511	7.4	M
Unionville Lake	Putnam	27, 66N, 19W	13	0.6	95	1207	39.1	E
Vandalia Lake	Pike	12, 53N, 5W	14	1.0	74	1067	38.9	E
Watkins Mill Lake	Clay	22, 53N, 30W	23	0.9	40	641	18.5	E
Waukomis Lake	Platte	17, 51N, 33W	10	1.7	25	593	13.7	E

Site Name	County	Location	Years[1]	Secchi[2]	TP[3]	TN[3]	Chl-a[5]	Trophic[6]
Weatherby Lake	Platte	15, 51N, 34W	3	2.0	20	403	5.0	M
Whiteside Lake	Lincoln	Surv. 1686	4	2.3	21	674	7.4	M
Willow Brook Lake	Dekalb	04, 58N, 13W	5	0.7	82	1161	50.4	E
Worth County Lake	Worth	32, 65N, 32W	3	0.6	74	1413	50.7	E
Vandalia Comm. Lake	Audrain	35, 52N, 6W	2	1.2	63	1239	24.5	E
OZARK BORDER								
*Ashland Lake	Boone	19, 46N, 11W	1	0.6	119	1684		HE
Beaver Lake	Butler	22, 25N, 4E	1	1.4	19	370	4.6	M
*Bella Vista Lake	Cape Girardeau	2/11, 32N, 13E	8	1.5	23	524	10.3	M
*Bennitt Lake	Howard	2, 51N, 14W	2	1.2	26	611	12.3	E
Binder Lake	Cole	36, 45N, 13W	18	1.0	56	782	26.0	E
*Boutin Lake	Cape Girardeau	15, 32N, 14E	8	1.6	25	622	10.8	M
Creve Coeur Lake	St. Louis	20,46N,05E	8	0.3	152	1064	58.2	HE
*D.C. Rogers Lake	Howard	10, 50N, 16W	11	1.2	33	542	8.8	M
*Dairy Farm Lake #1	Boone	34, 49N, 14W	4	0.4	223	2342	89.6	HE
*Dairy Farm Lake #3	Boone	34, 49N, 14W	4	0.5	484	1866	70.2	HE
*Eureka Lake	St. Louis	31, 44N, 4E	1	0.8	48	830	14.3	E
Fayette Lake #2	Howard	4, 50N, 16W	9	0.9	52	833	23.5	E
Glover Spring Lake	Callaway	13,47N, 9W	7	1.2	67	863	21.6	E
Goose Creek Lake	St. Francois	25, 38N, 6E	11	2.3	14	388	4.4	M
Higbee Lake	Randolph	09, 52N, 14W	3	1.6	27	636	7.7	M
Jennings Lake	St. Louis	8, 46N, 7E	1	0.7	78	682	18.0	E
Lake Forest	Ste. Genevieve	36, 38N, 7E	10	1.3	43	649	21.7	E
Lake Girardeau	Cape Girardeau	09, 30N, 11E	8	0.9	62	896	41.5	E
Lake Northwoods	Gasconade	33, 43N, 05W	12	1.2	24	448	4.8	M
Lake Pinewoods	Carter	7, 26N, 3E	8	1.5	29	644	14.2	E
Lake Tishomingo	Jefferson	5, 41N, 04E	11	1.9	22	490	5.6	M
Lake Wappapello	Wayne/Butler	3, 26N, 07E	23	0.9	38	537	26.0	E
Lake Wauwanoka	Jefferson	01, 40N, 04E	12	3.1	13	557	2.6	O
Manito Lake	Moniteau	8/9, 44N,17W	12	0.6	107	1049	20.5	E
Perry Co. Comm. Lake	Perry	22, 35N, 10E	9	0.8	87	1035	46.2	E
Pinnacle Lake	Montgomery	24, 47N, 05W	6	2.7	22	454	4.8	M
Prairie Home CA Lake #2	Cooper	4/6, 46N, 15W	3	1.0	32	669	9.5	E
Simpson Park Lake	St. Louis	16, 44, 5E	1	0.7	111	987	31.6	HE
Timberline Lake	St. Francois	23,24,38N,04E	11	4.2	9	294	2.1	O
*Tri-City Comm. Lake	Boone	24, 51N, 12W	11	0.8	57	874	19.2	E
Tywappity Lake	Scott	08, 29N, 13E	8	0.8	56	1079	44.2	E
Wanda Lee Lake	Ste. Genevieve	Surv. 884	10	1.3	56	577	26.2	E
*Wellsville Lake	Montgomery	33,50N, 6W	2	4.6	8	347	1.2	O
*Walter - MDC Diggs Area	Montgomery	31, 50N, 6W	1	0.5	70	1005	46.8	E
*Whitesell - MDC Diggs Area	Montgomery/Audrain	31, 50N, 6W	1	0.9	42	923	23.0	E
OSAGE PLAINS								
Adrian Reservoir	Bates	03, 41N, 31W	2	0.4	70	894	34.2	E
Amarugia Highlands Lake	Cass	10/11, 43N, 32W	10	1.0	49	660	11.8	E
Atkinson Lake	St. Clair	06, 37N, 28W	23	0.5	75	1041	39.0	E
Blue Springs Lake	Jackson	33 , 49N, 31W	6	1.0	36	557	17.7	E
Bushwhacker Lake	Vernon	26, 34N, 32W	5	1.4	30	622	15.5	E
Butler City Lake	Bates	14, 40N, 32W	5	0.7	67	941	33.2	E
Cat Claw Lake	Jackson	14, 47N, 31W	4	0.4	115	1089	32.8	E
Coot Lake	Jackson	22, 47N, 31W	4	0.6	59	1116	33.2	E
Cottontail Lake	Jackson	14, 47N, 31W	4	0.5	105	954	23.7	HE
Drexel City Reservoir South	Bates	7, 42N, 33W	1	0.9	53	1065	26.8	E
Drexel Lake	Bates	6, 42N, 33W	1	0.8	82	1558	18.8	E
*Four Rivers CA L.	Vernon	4, 37N, 31W	1	1.0	34	460	7.0	M

Site Name	County	Location	Years[1]	Secchi[2]	TP[3]	TN[3]	Chl-a[5]	Trophic[6]
Garden City Lake	Cass	31, 44N, 29W	2	0.5	83	1051	45.5	E
Gopher Lake	Jackson	23, 47N, 31W	4	0.4	112	1075	47.0	E
Harmony Mission Lake	Bates	15, 38N, 32W	9	1.1	51	840	24.3	E
Harrisonville Lake	Cass	26, 46N, 31W	9	0.8	52	951	18.8	E
Hazel Hill Lake	Johnson	27, 47N, 26W	12	0.8	53	1056	35.7	E
Holden City Lake	Johnson	29, 46N, 28W	8	0.8	46	901	14.9	E
Jackrabbit Lake	Jackson	15, 47N, 31W	4	0.6	118	769	15.5	HE
Lake Jacomo	Jackson	11, 48N, 31W	9	1.3	34	574	19.2	E
Lake Tapawingo	Jackson	34, 49N, 31W	8	1.2	36	788	31.6	E
Lamar Lake	Barton	32, 32N, 30W	12	0.8	83	1017	49.3	E
Lone Jack Lake	Jackson	11, 47N, 30W	3	1.7	28	646	16.9	E
Longview Lake	Jackson	04, 47N, 32W	9	0.8	36	746	12.3	E
Lotawana Lake	Jackson	29, 48N, 30W	9	1.4	33	680	18.8	E
Montrose Lake	Henry	33, 41N, 27W	11	0.3	190	1268	62.4	HE
Nell Lake	Jackson	22, 47N, 31W	4	0.6	94	1203	46.4	E
North Lake	Cass	28, 45N, 31W	23	0.7	103	1038	45.6	HE
Odessa Lake	Lafayette	15, 48N, 28W	3	1.4	39	853	22.5	E
Prairie Lee Lake	Jackson	27, 48N, 31W	9	0.8	56	903	26.4	E
Raintree Lake	Cass	06, 46N, 31W	23	0.7	55	879	15.1	E
Spring Fork Lake	Pettis	21, 44N, 21W	12	0.6	159	1141	48.4	HE
*Tebo Lake	Henry	25, 43N, 25W	6	2.8	18	609	4.4	M
Winnebago Lake	Cass	09, 46N, 31W	10	0.9	50	842	20.4	E
OZARK HIGHLANDS								
Austin Lake	Texas	30, 29N, 11W	11	1.6	22	553	8.1	M
Ben Branch	Osage	15/14, 44N, 8W	5	1.7	22	706	16.8	E
*Bismarck Lake (Disalvo)	St. Francois	19, 35N, 4E	12	1.3	39	511	19.5	E
Brays Lake	Phelps	35, 37N, 8W	1	2.2	14	388	3.5	M
Bull Shoals Lake	Ozark	21/34, 20N, 15W	8	2.2	18	360	7.5	M
Clearwater Lake	Reynolds	06, 28N, 3E	23	1.9	15	218	5.6	M
Council Bluff Lake	Iron	23, 35N, 1E	23	3.4	7	219	2.2	O
Crane Lake	Iron	33, 32N, 4E	9	1.3	14	239	3.9	M
Fellows Lake	Greene	22, 30N, 21W	23	2.7	13	348	4.9	M
Fourche Creek Lake	Ripley	22, 23N, 1W	11	3.4	9	245	2.6	O
Fredericktown City Lake	Madison	06, 33N, 7E	10	0.7	66	753	33.4	E
H. S. Truman Res.	Benton	07, 40N, 22W	23	1.2	43	824	17.4	E
Indian Hills Lake	Crawford	22/23, 39N, 5W	12	1.0	36	640	17.6	E
*Lafitte Lake	St. Francois	28, 37N, 4E	2	4.2	6	321	1.5	O
*Lake Capri	St. Francois	30, 37N, 4E	23	4.7	6	293	1.5	O
*Lake Carmel	St. Francois	18, 37N, 4E	12	2.8	10	311	2.7	O
Lake Killarney	Iron	01, 33N, 4E	8	0.8	62	613	28.4	E
*Lake Marseilles	St. Francois	29, 37N, 4E	11	3.6	10	350	2.4	O
Lake Niangua	Camden	19, 37N, 17W	1	0.6	55	690	9.8	M
Lake Of The Ozarks	Camden	19, 40N, 15W	22	1.9	30	606	15.6	E
Lake Shayne	Washington	25, 37N, 3E	22	3.1	6	267	1.3	O
Lake Springfield	Greene	19, 28N, 21W	8	0.9	59	1005	19.8	E
Lake Taneycomo	Taney	8, 23N, 20W	7	3.3	23	787	3.3	M
*Little Prairie Lake	Phelps	21, 38N, 7W	23	1.2	27	477	8.6	M
Loggers Lake	Shannon	10, 31N, 3W	8	3.1	10	224	3.5	M
Lower Taum Sauk Lake	Reynolds	33, 33N, 2E	9	2.1	12	196	3.8	M
Macs Lake (Ziske)	Dent	17, 34N, 5W	9	1.8	22	550	17.1	E
McCormick Lake	Oregon	24, 25N, 4W	3	3.3	5	112	0.7	O
Mcdaniel Lake	Greene	26, 30N, 22W	22	1.3	32	465	17.1	E
*Miller Lake	Carter	1, 27N, 1E	10	1.5	20	493	7.2	M
Monsanto Lake	St. Francois	19/20, 36N, 5E	10	2.2	10	378	2.2	O
Nims Lake	Madison	24, 34N, 6E	1	1.5	17	350	5.9	M

Site Name	County	Location	Years[1]	Secchi[2]	TP[3]	TN[3]	Chl-a[5]	Trophic[6]
Noblett Lake	Douglas	25, 26N, 11W	8	2.6	16	231	4.2	M
Norfork Lake	Ozark	21N, 12W	6	1.7	23	631	6.3	M
Palmer Lake	Washington	22, 36N, 1E	1	2.1	8	199	1.8	O
Peaceful Valley Lake	Gasconade	25, 42N, 6W	12	1.3	37	842	29.3	E
*Pomme De Terre Lake	Hickory/Polk	2, 36N, 22W	24	1.7	28	568	16.1	E
Pomona Lake	Howell	26, 26N, 9W	1		50	605	10.0	E
Ripley Lake	Ripley	10, 23N, 1E	7	1.7	28	719	21.2	E
Roby Lake	Texas	34/35, 33N, 11W	9	2.1	17	427	4.6	M
Shawnee Lake	Dent	17, 34N, 05W	8	1.8	26	553	19.6	E
Shepard Mountain Lake	Iron	01, 33N, 03E	1	1.3	32	454	21.3	E
Sims Valley Lake	Howell	17, 27N, 08W	9	1.1	26	498	13.4	M
Stockton Lake	Cedar	15, 34N, 26W	24	2.7	14	443	6.9	M
Sunnen Lake	Washington	04, 37N, 01E	13	2.7	13	282	3.6	M
Table Rock Lake	Stone	22, 22N, 22W	21	3.2	11	401	5.3	M
MISSISSIPPI LOWLANDS								
Big Oak Lake	Mississippi	14, 23N, 16E	2	0.6	44	530	12.1	E
*Upper Big Lake	Mississippi	28, 27N, 16E	2	0.3	339	2050	181	HE

[1]Years of Record
[2]Secchi disk depth (m)
[3]Total Phosphorus (µg/L)
[4]Total Nitrogen (µg/L)
[5]Chlorophyll A (µg/L)
[6]Trophic State: O=Oligotrophic, M=Mesotrophic, E=Eutrophic, HE=Hypereutrophic
*Unclassified Lake

APPENDIX E – Other Waters Rated as Impaired and Believed to be Impaired

The following list includes classified waters in Missouri found to be impaired, but which do not qualify for Section 303(d) listing. This list includes waters with approved TMDLs, waters where sufficient pollution control measures are in place, waters which are impaired by measures other than discrete pollutants, and other waters which were not approved for 303(d) listing by the Clean Water Commission.

WBID	Waterbody	Imp. Size (mi.)	County	Cause	Source	Category
1746	Big Bottom Cr.	0.6	Ste. Genevieve	Ammonia, Total	Municipal PSD	4A
1746	Big Bottom Cr.	1.5	Ste. Genevieve	Low Dissolved Oxygen	Municipal PSD	4A
2074	Big R.	55.6	Jefferson	Lead (S&T)	Mill Tailings	4A
1592	Brushy Cr.	3.1	Texas	Dissolved oxygen saturation	Municipal PSD	4A
3118	Buffalo Ditch	17.3	Dunklin	Low Dissolved Oxygen	Source Unknown	4A
3941	Cave Spring Br.	0.4	Jasper	Nitrogen, Total	Industrial PSD	4A
640	Chariton R.	111.1	Putnam/Chariton	Escherichia coli	Rural NPS	4A
3168	Chat Cr.	2.1	Lawrence	Zinc (W)	Subsurface, Hardrock, Mining	4A
1145	Dry Auglaize Cr.	3.0	Laclede	Cause Unknown	Source Unknown	4B
1145	Dry Auglaize Cr.	1.0	Lacelede	Low Dissolved Oxygen	Source Unknown	4B
811	E. Brush Cr.	1.1	Moniteau	Low Dissolved Oxygen	Municipal PSD	4B
2737	E. Fk. Black R.	0.5	Reynolds	Aquatic Inv. Bioassessments	Dam or Impoundment	4C
3964	East Whetstone Cr.	0.3	Wright	Ammonia, Total	Municipal PSD	4A
883	Gabriel Cr.	13.6	Morgan	Low Dissolved Oxygen	Municipal PSD	4B
430	Grand R.	8.0	Gentry	Fishes Bioassessments	Channelization	4C
1007	Hinkson Cr.	7.6	Boone	Cause Unknown	Urban Runoff/Storm Sewers	4A
2681	Jacks Fk.	7.5	Shannon	Escherichia coli	Recreational Pollution Sources; Municipal PSD	4A
3374	Jordan Cr.	2.0	Greene	Aquatic Inv. Bioassessments	Source Unknown	4A
3233	Joyce Cr.	4.5	Barry	Escherichia coli	Nonpoint Source	4A
1438	L. Lindley Cr.	3.7	Dallas	Aquatic Inv. Bioassessments	Source Unknown	4B
1381	L. Sac R.	37.0	Greene/Polk	Escherichia coli	Nonpoint Source; Agriculture	4A
7314	Lake Taneycomo	246.0 ac.	Taney	Dissolved oxygen saturation	Dam or Impoundment	4A
7356	Lamar Lake	148.0 ac.	Barton	Nutrient/Eutrophication Biological Indicators	Nonpoint Source	4A
857	Long Br.	6.0	Johnson/Pettis	Cause Unknown	Source Unknown	4A
857	Long Br.	6.0	Johnson/Pettis	Low Dissolved Oxygen	Source Unknown	4A
1308	Marmaton R.	35.7	Vernon	Low Dissolved Oxygen	Rural NPS	4A
2786	McKenzie Cr.	6.3	Wayne	Low Dissolved Oxygen	Municipal PSD	4B
2787	McKenzie Cr.	4.7	Wayne	pH	Municipal PSD; Source Unknown	4A
1284	Middle Fk. Tebo Cr.	3.0	Henry	Total Dissolved Solids	Coal Mining	4A
1234	Monegaw Cr.	2.1	St. Clair	Total Dissolved Solids	Coal Mining	4A
1300	Mound Br.	8.9	Bates	Dissolved oxygen saturation	Source Unknown	4A
56	N. Fabius R.	13.2	Clark/Lewis	Fishes Bioassessments	Channelization	4C
942	N. Moreau Cr.	10.9	Moniteau	Low Dissolved Oxygen	Source Unknown	4A
1031	Osage R.	9.7	Miller	Aquatic Inv. Bioassessments	Dam or Impoundment	4C
1387	Pea Ridge Cr.	1.5	Greene	Aquatic Inv. Bioassessments	Source Unknown	4C
1444	Piper Cr.	5.3	Polk	Aquatic Inv. Bioassessments	Source Unknown	4A
3232	Pogue Cr.	2.5	Barry	Escherichia coli	Rural NPS	4A

WBID	Waterbody	Imp. Size (mi.)	County	Cause	Source	Category
2128	Pond Cr.	1.0	Washington	Sedimentation/Siltation	Mill Tailings	4A
2128	Pond Cr.	1.0	Washington	Zinc (W)	Mill Tailings	4A
2859	Saline Cr.	1.7	Madison	Nickel (W)	Mine Tailings	4A
1319	Second Nicolson Cr.	4.5	Barton	Sulfates	Acid Mine Drainage	4A
2120	Shibboleth Br.	3.0	Washington	Lead (S)	Mill Tailings	4A
2120	Shibboleth Br.	3.0	Washington	Zinc (S)	Mill Tailings	4A
3230	Shoal Cr.	15.7	Barry/Newton	Fecal Coliform	Nonpoint Source	4A
1870	Spring Cr.	5.1	Dent	Low Dissolved Oxygen	Municipal PSD	4A
1870	Spring Cr.	5.1	Dent	Solids, Suspended/Bedload	Municipal PSD	4A
710	Stinson Cr.	1.9	Callaway	Low Dissolved Oxygen	Municipal PSD; Natural Conditions	4A
3822	Town Br.	2.5	Polk	Cause Unknown	Source Unknown	4A
3822	Town Br.	1.1	Polk	Total Suspended Solids	Municipal PSD	4A
2850	Trace Cr.	0.4	Madison	pH	Natural Sources	4A
1288	Trib. M. Fk. Tebo Cr.	3.1	Henry	pH	Coal Mining	4A
1288	Trib. M. Fk. Tebo Cr.	3.1	Henry	Total Dissolved Solids	Coal Mining	4A
3940	Trib. to Big Cr.	0.6	Iron	Cadmium (W)	Ind./Comm. Site Strmwtr Disch, Permitted	4A
3940	Trib. to Big Cr.	0.6	Iron	Zinc (W)	Ind./Comm. Site Strmwtr Disch, Permitted	4A
1225	Trib. to Big Otter Cr.	1.0	Henry	pH	Coal Mining	4A
3663	Trib. to Indian Cr.	0.3	Washington	Lead (W)	Subsurface, Hardrock, Mining	4A
2863	Village Cr.	1.9	Madison	Sedimentation/Siltation	Mill Tailings	4A
613	W. Fk. Locust Cr.	17.0	Sullivan	Aquatic Inv. Bioassessments	Source Unknown	4A
613	W. Fk. Locust Cr.	17.0	Sullivan	Low Dissolved Oxygen	Source Unknown	4A
400	W. Fk. Sni-a-bar Cr.	9.1	Jackson	Low Dissolved Oxygen	Source Unknown	4A
7009	Wyaconda Lake	9.0 ac.	Clark	Atrazine	Crop Production,Crop Land or Dry Land	4A

PSD = Point Source Discharge; NPS = Nonpoint Source; S = Sediment; T= Tissue; W = Water

APPENDIX F – Potentially Impaired Waters

The following waters are those for which there is some indication that an impairment to some designated use may exist, but the current data or information indicating the impairment do not meet the data requirements set out by Missouri's Section 303(d) Listing Methodology. The Department will make an effort to conduct further monitoring on these waters in order to determine defensibly whether these impairments actually exist.

WBID	Water Body Name	Size (mi./ac.)	Potential Pollutant or Condition	Category
2809	Ackerman Ditch	14.1	Habitat Degradation	3B
334	Agee Cr.	4.8	Habitat Degradation	3B
2093	Allen Br.	1.8	Fish Bioassessments/Unknown	3B
1799	Apple Cr.	44.8	Aquatic Macroinvertebrate Bioassessments/Unknown	2B
282	Arapahoe Cr.	8.0	Habitat Degradation	3B
2656	Barren Fk.	2.0	Fish Bioassessments/Unknown	3B
148	Bean Br.	8.7	Habitat Degradation	3B
193	Bear Cr.	16.1	Habitat Degradation	3B
272	Bear Cr.	9.8	Habitat Degradation	3B
416	Bear Cr.	4.5	Habitat Degradation	3B
1015	Bear Cr.	6.0	Fish Bioassessments/Unknown	3B
3266	Beaver Br.	3.5	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
3265	Beaver Br.	2.0	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
3267	Beaver Br.	1.5	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
1509	Beaver Cr.	5.7	Fish Bioassessments/Unknown	3B
145	Beaver Dam Cr.	5.0	Habitat Degradation	3B
137	Bee Cr.	5.8	Habitat Degradation	3B
273	Bee Cr.	29.4	Habitat Degradation	3B
3966	Bee Fk.	5.9	Heavy Metals in Sediment	2B
2179	Belew Cr.	7.0	Fish Bioassessments/Unknown and Low Dissolved Oxygen	2B
220	Belleau Cr.	10.9	Habitat Degradation	3B
207	Big Cr.	17.7	Habitat Degradation	3B
205	Big Cr.	10.3	Habitat Degradation	3B
2647	Big Cr.	23.0	Fish and Aquatic Macroinvertebrate Bioassessments/Unknown	3B
180	Big Lead Cr.	5.0	Habitat Degradation	3B
441	Big Muddy Cr.	12.0	Habitat Degradation	3B
462	Big Muddy Cr.	10.9	Habitat Degradation	3B
461	Big Muddy Cr.	10.2	Habitat Degradation	3B
465	Big Rock Cr.	5.9	Habitat Degradation	3B
464	Big Rock Cr.	3.7	Habitat Degradation	3B
1608	Bigelow's Cr.	5.0	Low Dissolved Oxygen	3B
124	Billys Br.	11.5	Habitat Degradation	3B
112	Black Cr.	21.8	Low Dissolved Oxygen	2B
2807	Black R. Ditch	11.1	Habitat Degradation	3B
891	Blackwater R.	79.4	Habitat Degradation	3B

WBID	Water Body Name	Size (mi./ac.)	Potential Pollutant or Condition	Category
7370	Bluestem Lake	13.0 ac.	Mercury (Fish Tissue)	3B
1983	Brazil Cr.	13.9	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
66	Bridge Cr.	8.4	Habitat Degradation	3B
70	Bridge Cr.	27.0	Habitat Degradation	3B
107	Brush Cr.	3.4	Habitat Degradation	3B
192	Brush Cr.	7.8	Habitat Degradation	3B
276	Brush Cr.	7.4	Habitat Degradation	3B
408	Brush Cr.	5.9	Habitat Degradation	3B
2056	Brush Cr.	2.0	Fish Bioassessments/Unknown	3B
69	Brushy Cr.	4.5	Habitat Degradation	3B
167	Brushy Cr.	3.0	Habitat Degradation	3B
336	Brushy Cr.	12.1	Habitat Degradation	3B
377	Brushy Cr.	7.0	Habitat Degradation	3B
395	Brushy Cr.	2.2	Habitat Degradation	3B
438	Brushy Cr.	5.4	Habitat Degradation	3B
531	Brushy Cr.	8.1	Habitat Degradation	3B
7117	Buffalo Bill Lake	45.0 ac.	Mercury (Fish Tissue)	3B
3264	Bullskin Cr.	4.9	Fish Bioassessments/Unknown	2B
363	Burr Oak Cr.	2.0	Habitat Degradation	3B
203	Butcher Cr.	1.0	Habitat Degradation	3B
1606	Callaway Fk.	4.5	Fish Bioassessments/Unknown	3B
198	Camp Br.	4.0	Habitat Degradation	3B
197	Camp Cr.	6.0	Habitat Degradation	3B
196	Camp Cr.	6.3	Habitat Degradation	3B
491	Campbell Cr.	2.8	Habitat Degradation	3B
2820	Cane Cr. Ditch	7.5	Habitat Degradation	3B
2560	Caney Cr.	7.0	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
389	Carroll Cr.	9.4	Habitat Degradation	3B
209	Casmer Br.	1.5	Habitat Degradation	3B
476	Chapman Br.	1.9	Habitat Degradation	3B
7048	City Lake #2 - Perry	7.0 ac.	Atrazine	3B
117	Clear Cr.	4.7	Habitat Degradation	3B
292	Clear Cr.	13.0	Habitat Degradation	3B
390	Clear Cr.	13.5	Habitat Degradation	3B
433	Clear Cr.	6.0	Habitat Degradation	3B
2082	Clear Cr.	4.4	Fish Bioassessments/Unknown	3B
388	Clear Cr.	5.0	Habitat Degradation	3B
225	Cole Cr.	7.4	Habitat Degradation	3B
269	Contrary Cr.	10.0	Habitat Degradation	3B
132	Coon Cr.	11.8	Low Dissolved Oxygen	2B
187	Coon Cr.	13.2	Habitat Degradation	3B
208	Coon Cr.	9.2	Habitat Degradation	3B
410	Cottonwood Cr.	3.9	Habitat Degradation	3B
527	Cottonwood Cr.	4.3	Habitat Degradation	3B
1947	Courtois Cr.	1.7	Aquatic Macroinvertebrate Bioassessments/Unknown	3B

WBID	Water Body Name	Size (mi./ac.)	Potential Pollutant or Condition	Category
247	Cow Br.	4.4	Habitat Degradation	3B
536	Crabapple Cr.	3.8	Habitat Degradation	3B
188	Crooked Cr.	4.0	Habitat Degradation	3B
330	Crooked Cr.	2.8	Habitat Degradation	3B
333	Crooked Cr.	4.0	Habitat Degradation	3B
201	Crooked Cr.	1.5	Habitat Degradation	3B
376	Crooked R.	7.5	Habitat Degradation	3B
371	Crooked R.	58.1	Habitat Degradation	3B
152	Cuivre R.	30.0	Bacteria	2B
2662	Current R.	18.8	Mercury (Fish Tissue)	2B
443	Cypress Cr.	15.8	Habitat Degradation	3B
2616	Cypress Ditch #1	9.7	Habitat Degradation	3B
144	Davis Cr.	8.8	Low Dissolved Oxygen	3B
255	Davis Cr.	3.5	Habitat Degradation	3B
253	Davis Cr. Ditch	6.7	Habitat Degradation	3B
539	Dead Oak Br.	1.0	Habitat Degradation	3B
320	Dicks Cr.	7.3	Habitat Degradation	3B
268	Dillon Cr.	4.8	Habitat Degradation	3B
2998	Ditch #10	3.5	Mercury (Fish Tissue)	3B
3812	Ditch #11	3.0	Habitat Degradation	3B
3813	Ditch #16	11.2	Habitat Degradation	3B
2618	Ditch #2	6.0	Habitat Degradation	3B
2617	Ditch #2	3.2	Habitat Degradation	3B
2772	Ditch #22	7.0	Habitat Degradation	3B
2773	Ditch #23	5.8	Habitat Degradation	3B
2077	Ditch Cr.	1.8	Fish Bioassessments/Unknown	3B
2776	Ditch to Black R.	10.7	Habitat Degradation	3B
2770	Ditch to Black R.	9.5	Habitat Degradation	3B
2619	Ditch to Ditch #2	1.5	Habitat Degradation	3B
510	Dog Cr.	5.7	Habitat Degradation	3B
182	Dry Br.	5.1	Habitat Degradation	3B
3418	Dry Cr.	9.3	Fish Bioassessments/Unknown	3B
1862	Dry Fk.	23.3	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
288	E. Br. Elkhorn Cr.	4.7	Habitat Degradation	3B
257	E. Br. Squaw Cr.	4.2	Habitat Degradation	3B
3107	E. Ditch #1	22.0	Low Dissolved Oxygen	3B
463	E. Fk. Big Muddy Cr.	2.0	Habitat Degradation	3B
373	E. Fk. Crooked R.	6.4	Habitat Degradation	3B
386	E. Fk. Fishing R.	12.9	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
467	E. Fk. Grand R.	6.5	Habitat Degradation	3B
1926	E. Fk. Huzzah Cr.	2.0	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
428	E. Fk. L. Blue R.	3.7	Habitat Degradation	3B
249	E. Fk. L. Tarkio Cr.	17.8	Habitat Degradation	3B
497	E. Fk. Lost Cr.	10.0	Habitat Degradation	3B
932	E. Fk. Postoak Cr.	12.2	Habitat Degradation	3B

WBID	Water Body Name	Size (mi./ac.)	Potential Pollutant or Condition	Category
398	E. Fk. Shoal Cr.	2.9	Habitat Degradation	3B
402	E. Fk. Sni-a-bar Cr.	9.6	Habitat Degradation	3B
2085	Ebo Cr.	1.6	Fish Bioassessments/Unknown	3B
414	Edmondson Cr.	1.9	Habitat Degradation	3B
130	Elk Fk. Salt R.	7.7	Habitat Degradation	3B
287	Elkhorn Cr.	11.8	Habitat Degradation	3B
149	Elm Br.	3.0	Habitat Degradation	3B
331	Elm Grove Br.	4.2	Habitat Degradation	3B
55	Fabius R.	3.5	Habitat Degradation	2B
3370	Fassnight Cr.	2.8	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
1705	Fee Fee Cr. (old)	1.0	Habitat Degradation	3B
1605	Femme Osage Cr.	8.2	Mercury (Fish Tissue)	3B
375	Fire Br.	5.4	Habitat Degradation	3B
318	First Cr.	4.7	Habitat Degradation	3B
143	Fish Br.	1.9	Habitat Degradation	3B
129	Flat Cr.	13.5	Habitat Degradation	3B
471	Fletchall Cr.	4.0	Habitat Degradation	3B
289	Florida Cr.	8.4	Habitat Degradation	3B
114	Floyd Cr.	5.1	Habitat Degradation	3B
135	Galbreath Cr.	5.8	Habitat Degradation	3B
3373	Galloway Cr.	3.2	Aquatic Macroinvertebrate Bioassessments and pH	3B
407	Garrison Fk.	6.8	Habitat Degradation	3B
1496	Gasconade R.	11.2	Fish Bioassessments/Unknown	3B
532	Goose Cr.	4.4	Habitat Degradation	3B
456	Goose Cr.	2.4	Habitat Degradation	3B
72	Grassy Cr.	19.8	Habitat Degradation	3B
7161	Green City Lake	57.0 ac.	Mercury (Fish Tissue)	3B
233	Greys Lake	5.2	Habitat Degradation	3B
321	Grove Cr.	3.3	Habitat Degradation	3B
3204	Grove Cr.	2.9	Lead and Zinc in Sediment	2B
2615	Harviell Ditch (#3)	16.2	Habitat Degradation	3B
285	Hayzlett Br.	2.4	Habitat Degradation	3B
2181	Heads Cr.	2.7	Fish Bioassessments/Unknown	2B
266	Hickory Cr	1.0	Habitat Degradation	3B
186	Hickory Cr.	6.6	Habitat Degradation	3B
308	Hickory Cr.	1.2	Habitat Degradation	3B
335	Hickory Cr.	1.5	Habitat Degradation	3B
442	Hickory Cr.	2.8	Habitat Degradation	3B
490	Hickory Cr.	3.0	Habitat Degradation	3B
229	High Cr.	3.7	Habitat Degradation	3B
228	High Cr. Ditch	5.7	Habitat Degradation	3B
307	Highly Cr.	3.9	Habitat Degradation	3B
350	Holland Br.	3.0	Habitat Degradation	3B
351	Holtzclaw Cr.	2.0	Habitat Degradation	3B
338	Honey Cr.	6.7	Habitat Degradation	3B

WBID	Water Body Name	Size (mi./ac.)	Potential Pollutant or Condition	Category
509	Honey Cr.	8.3	Habitat Degradation	3B
919	Honey Cr.	7.0	Habitat Degradation	3B
127	Hoover Cr.	7.2	Habitat Degradation	3B
306	Huff Cr.	2.0	Habitat Degradation	3B
435	Hurricane Br.	1.8	Habitat Degradation	3B
432	Indian Br.	3.8	Habitat Degradation	3B
211	Indian Camp Cr.	3.3	Habitat Degradation	3B
62	Indian Cr.	3.5	Habitat Degradation	3B
171	Indian Cr.	20.0	Habitat Degradation	3B
477	Indian Cr.	3.2	Habitat Degradation	3B
1999	Indian Cr.	21.4	Temperature	3B
234	Iowa Ditch	2.8	Habitat Degradation	3B
494	Irvins Br.	3.3	Habitat Degradation	3B
485	Island Cr.	8.9	Habitat Degradation	3B
286	Jenkins Cr.	7.2	Habitat Degradation	3B
1719	Joachim Cr.	30.2	Lead in Sediment	2B
184	Johns Br.	1.3	Habitat Degradation	3B
3968	Jones Br.	0.0	VOCs in sediment	3B
275	Jordan Br.	7.2	Habitat Degradation	3B
329	Jordan Cr.	1.4	Habitat Degradation	3B
3374	Jordan Cr.	3.8	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
384	Keeney Cr.	4.9	Habitat Degradation	3B
516	Kettle Cr.	0.8	Habitat Degradation	3B
263	Kimsey Cr.	2.5	Habitat Degradation	3B
262	Kimsey Cr.	0.8	Habitat Degradation	3B
264	Kimsey Cr.	6.7	Habitat Degradation	3B
2171	Koen Cr.	1.0	Fish Bioassessments/Unknown	3B
194	L. Bear Cr.	4.0	Habitat Degradation	3B
424	L. Blue R.	4.3	Habitat Degradation	3B
118	L. Crooked Cr.	4.7	Habitat Degradation	3B
223	L. Dardenne Cr.	5.1	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
79	L. Fabius R.	36.4	Habitat Degradation	3B
3591	L. Fox Cr.	0.7	Fish Bioassessments/Unknown	3B
39	L. Fox R.	19.8	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
181	L. Lead Cr.	4.0	Habitat Degradation	3B
1619	L. Lost Cr.	1.5	Fish Bioassessments/Unknown	3B
814	L. Moniteau Cr.	5.1	Fish Bioassessments/Unknown	3B
440	L. Muddy Cr.	4.1	Habitat Degradation	3B
120	L. Otter Cr.	6.2	Habitat Degradation	3B
526	L. Otter Cr.	3.0	Habitat Degradation	3B
165	L. Sandy Cr.	6.0	Habitat Degradation	3B
404	L. Sni-a-bar Cr.	7.5	Habitat Degradation	3B
403	L. Sni-a-bar Cr.	6.7	Habitat Degradation	3B
409	L. Tabo Cr.	9.2	Habitat Degradation	3B
250	L. Tarkio Cr.	15.4	Habitat Degradation	3B

WBID	Water Body Name	Size (mi./ac.)	Potential Pollutant or Condition	Category
251	L. Tarkio Ditch	6.6	Habitat Degradation	3B
328	L. Third Fk. Platte R.	26.0	Habitat Degradation	3B
53	L. Wyaconda R.	7.5	Habitat Degradation	3B
52	L. Wyaconda R.	7.4	Habitat Degradation	3B
359	Lake Cr.	5.7	Habitat Degradation	3B
431	Lake Cr.	3.3	Habitat Degradation	3B
7035	Lake Tom Sawyer	4.0 ac.	Mercury (Fish Tissue)	3B
7100	Lakewood Lakes	279.0 ac.	Mercury (Fish Tissue)	2B
507	Larry Cr.	1.2	Habitat Degradation	3B
179	Lead Cr.	7.5	Habitat Degradation	3B
178	Lead Cr.	1.0	Habitat Degradation	3B
515	Lick Fk.	9.8	Habitat Degradation	3B
514	Lick Fk.	5.7	Habitat Degradation	3B
280	Lincoln Cr.	7.4	Habitat Degradation	3B
452	Little Cr.	11.3	Habitat Degradation	3B
147	Littleby Cr.	16.0	Habitat Degradation	3B
533	Log Cr.	8.8	Habitat Degradation	3B
139	Long Br.	29.0	Habitat Degradation	3B
243	Long Br.	3.0	Habitat Degradation	3B
340	Long Br.	15.0	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
488	Long Br.	5.7	Habitat Degradation	3B
535	Long Cr.	3.3	Habitat Degradation	3B
1618	Lost Cr.	3.8	Fish Bioassessments/Unknown	3B
1617	Lost Cr.	6.4	Fish Bioassessments/Unknown	3B
466	Lotts Cr.	9.7	Habitat Degradation	3B
425	Lumpkin Cr.	0.5	Habitat Degradation	3B
267	Mace Cr.	5.8	Habitat Degradation	3B
7398	Maple Leaf Lake	127.0 ac.	Mercury (Fish Tissue)	3B
1297	Marais des Cygnes R.	32.0	Bacteria	2B
475	Marlowe Cr.	1.0	Habitat Degradation	3B
474	Marlowe Cr.	6.7	Habitat Degradation	3B
511	Marrowbone Cr.	13.9	Habitat Degradation	3B
1338	McCarty Cr.	13.2	Habitat Degradation and pH	3B
214	McCoy Cr.	1.9	Low Dissolved Oxygen	2B
231	McElroy Cr.	3.0	Habitat Degradation	3B
324	McGuire Br.	5.4	Habitat Degradation	3B
7013	Memphis Reservoir	39.0 ac.	Temperature	3B
258	Middle Br. Squaw Cr.	3.0	Habitat Degradation	3B
472	Middle Fk. Grand R.	2.5	Habitat Degradation	3B
496	Middle Fk. Lost Cr.	8.0	Habitat Degradation	3B
245	Middle Tarkio Cr.	10.0	Habitat Degradation	3B
529	Mill Cr.	1.3	Habitat Degradation	3B
265	Mill Cr.	10.0	Habitat Degradation	3B
301	Mill Cr.	10.8	Habitat Degradation	3B
740	Millers Cr.	1.9	Aquatic Macroinvertebrate Bioassessments/Unknown	3B

WBID	Water Body Name	Size (mi./ac.)	Potential Pollutant or Condition	Category
134	Milligan Cr.	9.0	Habitat Degradation	3B
1544	Mistaken Cr.	1.5	Unknown (Biological Data)	3B
483	Moccasin Cr.	2.6	Habitat Degradation	3B
302	Moss Br.	2.4	Habitat Degradation	3B
369	Moss Cr.	13.7	Habitat Degradation	3B
426	Mouse Cr.	1.5	Low Dissolved Oxygen	2B
343	Mozingo Cr.	5.1	Habitat Degradation	3B
128	Mud Cr.	17.5	Habitat Degradation	3B
541	Mud Cr.	6.7	Habitat Degradation	3B
538	Mud Cr.	4.5	Habitat Degradation	3B
537	Mud Cr. Ditch	3.5	Habitat Degradation	3B
291	Muddy Cr.	5.2	Habitat Degradation	3B
434	Muddy Cr.	3.7	Habitat Degradation	3B
492	Muddy Cr.	9.7	Habitat Degradation	3B
391	Muddy Fk.	8.4	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
59	N. Fabius R.	1.0	Habitat Degradation	3B
65	N. Fk. M. Fabius R.	28.2	Habitat Degradation	3B
58	N. Fk. N. Fabius R.	9.0	Habitat Degradation	3B
113	N. Fk. Salt R.	17.2	Habitat Degradation	3B
540	N. Mud Cr.	6.2	Habitat Degradation	3B
49	N. Wyaconda R.	9.2	Habitat Degradation	3B
126	Narrows Cr.	2.6	Habitat Degradation	3B
277	Naylor Cr.	1.0	Habitat Degradation	3B
2752	Neals Cr.	3.2	Nickel in Sediment	2B
392	New Hope Cr.	5.5	Habitat Degradation	3B
309	Nichols Cr.	4.6	Habitat Degradation	3B
3811	North Branch Wilsons Cr.	3.8	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
344	Norvey Cr.	9.3	Habitat Degradation	3B
175	Nulls Cr.	5.8	Habitat Degradation	3B
261	Old Ch. L. Tarkio Cr.	8.3	Habitat Degradation	3B
260	Old Ch. L. Tarkio Cr.	5.3	Habitat Degradation	3B
240	Old Ch. Nishnabotna R.	3.0	Habitat Degradation	3B
238	Old Ch. Nishnabotna R.	13.7	Habitat Degradation	3B
513	Old Chan. Grand R.	3.1	Habitat Degradation	3B
517	Old Chan. Grand R.	2.5	Habitat Degradation	3B
512	Old Chan. Grand R.	15.2	Habitat Degradation	3B
284	Old Chan. Nodaway R.	10.0	Habitat Degradation	3B
294	Old Chan. Nodaway R.	1.2	Habitat Degradation	3B
295	Old Chan. Nodaway R.	2.0	Habitat Degradation	3B
297	Old Chan. Nodaway R.	1.5	Habitat Degradation	3B
298	Old Chan. Nodaway R.	1.0	Habitat Degradation	3B
299	Old Chan. Nodaway R.	2.5	Habitat Degradation	3B
300	Old Chan. Nodaway R.	3.7	Habitat Degradation	3B
304	Old Chan. Nodaway R.	2.5	Habitat Degradation	3B
305	Old Chan. Nodaway R.	2.8	Habitat Degradation	3B

WBID	Water Body Name	Size (mi./ac.)	Potential Pollutant or Condition	Category
311	Old Chan. Nodaway R.	1.0	Habitat Degradation	3B
325	Old Chan. Platte R.	3.4	Habitat Degradation	3B
326	Old Chan. Platte R.	2.2	Habitat Degradation	3B
332	Old Chan. Platte R.	4.0	Habitat Degradation	3B
341	Old Chan. Platte R.	5.0	Habitat Degradation	3B
348	Old Chan. Platte R.	1.0	Habitat Degradation	3B
368	Old Chan. Wakenda Cr.	3.0	Habitat Degradation	3B
1472	Osage Fk.	69.0	Bacteria	2B
525	Otter Cr.	2.5	Habitat Degradation	3B
358	Palmer Cr.	2.8	Habitat Degradation	3B
357	Palmer Cr.	12.2	Habitat Degradation	3B
7441	Palmer Lake	102.0 ac.	Mercury (Fish Tissue)	3B
460	Panther Cr.	4.8	Habitat Degradation	3B
521	Panther Cr.	5.0	Habitat Degradation	3B
176	Paris Br.	3.0	Habitat Degradation	3B
470	Peddler Cr.	3.0	Habitat Degradation	3B
469	Peddler Cr.	1.5	Habitat Degradation	3B
283	Pedlar Cr.	5.4	Habitat Degradation	3B
99	Peno Cr.	14.4	Low Dissolved Oxygen and Ammonia	3B
349	Pigeon Cr.	7.2	Habitat Degradation	3B
2813	Pike Cr. Ditch	4.0	Habitat Degradation	3B
439	Pilot Grove Cr.	5.4	Habitat Degradation	3B
2692	Pine Cr.	1.0	Fish Bioassessments/Unknown	3B
1728	Plattin Cr.	19.9	Ammonia	2B
445	Polecat Cr.	11.1	Habitat Degradation	3B
2192	Pomme Cr.	1.8	Habitat Degradation	3B
2127	Pond Cr.	1.3	Zinc in sediment and sediment deposition	2B
195	Poor Br.	3.0	Habitat Degradation	3B
313	Prairie Cr.	3.7	Habitat Degradation	3B
520	Rattlesnake Cr.	3.0	Habitat Degradation	3B
2037	Red Oak Cr.	5.2	Low Dissolved Oxygen	2B
136	Reese Fk.	7.0	Habitat Degradation	3B
168	Reid Cr.	2.0	Habitat Degradation	3B
347	Riggin Br.	1.9	Habitat Degradation	3B
3827	River des Peres	3.7	Chloride and Bacteria	3B
78	Rock Cr.	4.8	Habitat Degradation	3B
237	Rock Cr.	19.0	Habitat Degradation	3B
236	Rock Cr.	2.2	Habitat Degradation	3B
378	Rocky Fk.	4.0	Habitat Degradation	3B
382	Rollins Cr.	7.0	Habitat Degradation	3B
278	Rush Cr.	4.5	Habitat Degradation	3B
506	S. Big Cr.	5.6	Habitat Degradation	3B
108	S. Brush Cr.	2.0	Habitat Degradation	3B
921	S. Fk. Blackwater R.	5.7	Habitat Degradation	3B
293	S. Fk. Clear Cr.	6.0	Habitat Degradation	3B

WBID	Water Body Name	Size (mi./ac.)	Potential Pollutant or Condition	Category
68	S. Fk. M. Fabius R.	13.0	Habitat Degradation	3B
67	S. Fk. M. Fabius R.	14.8	Habitat Degradation	3B
60	S. Fk. N. Fabius R.	11.5	Habitat Degradation	3B
77	S. Fk. S. Fabius R.	18.3	Habitat Degradation	3B
76	S. Fk. S. Fabius R.	7.9	Habitat Degradation	3B
542	S. Mud Cr.	3.8	Habitat Degradation	3B
51	S. Wyaconda R.	17.5	Habitat Degradation	3B
2190	Saline Cr.	2.3	Low Dissolved Oxygen	3B
2189	Saline Cr.	1.8	Low Dissolved Oxygen	3B
413	Salt Br.	5.7	Habitat Degradation	3B
455	Sampson Cr.	5.6	Habitat Degradation	3B
453	Sampson Cr.	13.5	Habitat Degradation	3B
290	Sand Cr.	4.9	Habitat Degradation	3B
206	Sand Run	2.0	Habitat Degradation	3B
183	Sandy Cr.	6.0	Habitat Degradation	3B
317	Second Cr.	11.5	Habitat Degradation	3B
385	Shackelford Br.	5.9	Habitat Degradation	3B
172	Shady Cr.	9.4	Habitat Degradation	3B
450	Shain Cr.	13.0	Habitat Degradation	3B
2865	Shays Cr.	1.7	Heavy Metals in Sediment	3B
530	Sheep Cr.	1.0	Habitat Degradation	3B
397	Shoal Cr.	10.6	Habitat Degradation	3B
396	Shoal Cr.	10.3	Habitat Degradation	3B
518	Shoal Cr.	54.6	Habitat Degradation	3B
1934	Shoal Cr.	7.7	Fish Bioassessments/Unknown	3B
3229	Shoal Cr.	0.5	Bacteria	3B
519	Shoal Cr. Ditch	9.8	Habitat Degradation	3B
3244	Silver Cr.	1.9	Lead and Zinc in sediment	2B
174	Sitton Br.	2.8	Habitat Degradation	3B
173	Sitton Br.	0.8	Habitat Degradation	3B
353	Smith Fk.	3.0	Habitat Degradation	3B
401	Sni-a-bar Cr.	4.3	Habitat Degradation	3B
2775	Snyder Ditch	6.5	Habitat Degradation	3B
3369	South Cr.	3.8	Aquatic Macroinvertebrate Bioassessments/Unknown, pH, Bacteria	2B
3	South R.	16.3	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
7187	Spring Fork Lake	178.0 ac.	Nutrients	2B
3167	Spring R.	1.0	Bacteria	3B
3159	Spring R.	0.5	Heavy Metals in Sediment	3B
252	Squaw Cr.	21.0	Habitat Degradation	3B
1486	Steins Cr.	16.6	Fish Bioassessments/Unknown	3B
2810	Stillcamp Ditch	12.3	Habitat Degradation	3B
489	Stillhouse Br.	2.0	Habitat Degradation	3B
156	Sugar Cr.	11.0	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
271	Sugar Cr.	6.5	Habitat Degradation	3B
270	Sugar Cr.	3.0	Habitat Degradation	3B

WBID	Water Body Name	Size (mi./ac.)	Potential Pollutant or Condition	Category
169	Sulphur Cr.	9.3	Habitat Degradation	3B
2867	Sweetwater Br.	1.7	Lead in Sediment	3B
2866	Sweetwater Br.	1.0	Heavy Metals in Sediment	3B
406	Tabo Cr.	8.4	Habitat Degradation	3B
405	Tabo Cr.	11.4	Habitat Degradation	3B
2509	Tabor Cr.	5.6	Fish and Aquatic Macroinvertebrate Bioassessments/Unknown	3B
242	Tarkio R.	33.5	Habitat Degradation	3B
458	Thompson Br.	1.0	Habitat Degradation	3B
437	Thompson Cr.	1.6	Habitat Degradation	3B
3763	Tiff Cr.	2.1	Fish Bioassessments/Unknown	3B
64	Tobin Cr.	8.0	Habitat Degradation	3B
239	Tr. to O. Ch. Nishnabotna R.	0.9	Habitat Degradation	3B
241	Tr. to O. Ch. Nishnabotna R.	2.0	Habitat Degradation	3B
365	Trib to Crabapple Cr.	1.3	Habitat Degradation	3B
473	Trib. M. Fk. Grand R.	1.4	Habitat Degradation	3B
125	Trib. M. Fk. Salt R.	1.0	Habitat Degradation	3B
274	Trib. to Bee Cr.	1.8	Habitat Degradation	3B
3967	Trib. to Bee Cr.	0.5	Heavy Metals in Water and Sediment	3B
2674	Trib. to Big Cr.	3.0	Fish Bioassessments/Unknown	3B
2923	Trib. to Big Cr.	1.0	Heavy Metals in Sediment	3B
323	Trib. to Castile Cr.	1.2	Habitat Degradation	3B
393	Trib. to Clear Cr.	2.2	Habitat Degradation	3B
254	Trib. to Davis Cr.	3.0	Habitat Degradation	3B
374	Trib. to E. Fk. Crooked R.	4.8	Habitat Degradation	3B
429	Trib. to E. Fk. L. Blue R.	1.9	Habitat Degradation	3B
415	Trib. to Edmondson Cr.	3.1	Habitat Degradation	3B
504	Trib. to Grindstone Cr.	1.0	Habitat Degradation	3B
232	Trib. to High Cr.	2.0	Habitat Degradation	3B
3962	Trib. to L. Blue R.	5.9	Habitat Degradation	2B
166	Trib. to L. Sandy Cr.	2.1	Habitat Degradation	3B
303	Trib. to Mill Cr.	1.8	Habitat Degradation	3B
2115	Trib. to Mineral Fk.	2.0	Lead and Zinc in sediment	2B
411	Trib. to Missouri R.	5.3	Habitat Degradation	3B
370	Trib. to Moss Cr.	0.5	Habitat Degradation	3B
544	Trib. to Mud Cr.	2.0	Habitat Degradation	3B
545	Trib. to Mud Cr.	1.0	Habitat Degradation	3B
546	Trib. to Mud Cr.	0.8	Habitat Degradation	3B
3261	Trib. to N. Indian Cr.	1.3	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
310	Trib. to Nichols Cr.	1.3	Habitat Degradation	3B
281	Trib. to Nodaway R.	1.0	Habitat Degradation	3B
522	Trib. to Panther Cr.	2.4	Habitat Degradation	3B
314	Trib. to Prairie Cr.	1.0	Habitat Degradation	3B
61	Trib. to S. Fk. N. Fabius R.	4.1	Habitat Degradation	3B
146	Trib. to S. Fk. Salt R.	0.5	Habitat Degradation	3B
2868	Trib. to Sweetwater Br.	1.0	Lead in Sediment	3B

WBID	Water Body Name	Size (mi./ac.)	Potential Pollutant or Condition	Category
524	Trib. to Turkey Cr.	1.0	Habitat Degradation	3B
500	Trib. to W. Fk. Lost Cr.	2.8	Habitat Degradation	3B
501	Trib. to W. Fk. Lost Cr.	2.6	Habitat Degradation	3B
481	Trib. to Wildcat Cr.	2.0	Habitat Degradation	3B
484	Trib. to Wildcat Cr.	2.0	Habitat Degradation	3B
73	Troublesome Cr.	4.8	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
534	Tub Cr.	1.0	Habitat Degradation	3B
138	Turkey Cr.	3.3	Habitat Degradation	3B
199	Turkey Cr.	1.5	Habitat Degradation	3B
362	Turkey Cr.	3.5	Habitat Degradation	3B
486	Turkey Cr.	1.8	Habitat Degradation	3B
523	Turkey Cr.	2.5	Habitat Degradation	3B
2985	Turkey Cr.	3.1	Low Dissolved Oxygen and Ammonia	3B
361	Turkey Cr.	4.7	Habitat Degradation	3B
7099	Unity Village Lake #2	26.0 ac.	Mercury (Fish Tissue)	3B
412	Van Meter Ditch	4.5	Habitat Degradation	3B
449	W. Fk. Big Cr.	18.0	Habitat Degradation	3B
380	W. Fk. Crooked R.	9.8	Habitat Degradation	3B
379	W. Fk. Crooked R.	6.6	Habitat Degradation	3B
185	W. Fk. Cuivre R.	23.9	Habitat Degradation	3B
177	W. Fk. Cuivre R.	42.4	Habitat Degradation	3B
499	W. Fk. Lost Cr.	11.7	Habitat Degradation	3B
929	W. Fk. Post Oak Cr.	12.8	Habitat Degradation	3B
367	W. Fk. Wakenda Cr.	7.8	Habitat Degradation	3B
366	W. Fk. Wakenda Cr.	3.3	Habitat Degradation	3B
230	W. High Cr.	2.8	Habitat Degradation	3B
246	W. Tarkio Cr.	9.6	Habitat Degradation	3B
244	W. Tarkio Cr.	1.2	Habitat Degradation	3B
364	Wakenda Cr.	10.6	Habitat Degradation	3B
360	Wakenda Cr.	29.2	Habitat Degradation	3B
2136	Wallen Cr.	1.4	Aquatic Macroinvertebrate Bioassessments/Unknown	3B
1339	Walnut Cr.	2.3	Low Dissolved Oxygen	3B
487	Walnut Fk.	4.3	Habitat Degradation	3B
505	Wamsley Cr.	1.7	Habitat Degradation	3B
2374	Ward Br.	3.3	Aquatic Macroinvertebrate Bioassessments/Unknown, pH, Bacteria	2B
7072	Waukomis Lake	76.0 ac.	Mercury (Fish Tissue)	3B
459	Weldon Br.	4.4	Habitat Degradation	3B
503	Wheeler Cr.	2.4	Habitat Degradation	3B
200	Whitcomb Br.	2.5	Habitat Degradation	3B
346	White Cloud Cr.	12.8	Habitat Degradation	3B
190	White Oak Cr.	2.6	Habitat Degradation	3B
454	White Oak Cr.	9.0	Habitat Degradation	3B
259	Wildcat Cr.	4.0	Habitat Degradation	3B
482	Wildcat Cr.	7.4	Habitat Degradation	3B
480	Wildcat Cr.	6.2	Habitat Degradation	3B

WBID	Water Body Name	Size (mi./ac.)	Potential Pollutant or Condition	Category
387	Williams Cr.	9.1	Habitat Degradation	3B
381	Willow Cr.	6.5	Habitat Degradation	3B
498	Willow Cr.	1.0	Habitat Degradation	3B
543	Willow Cr.	1.5	Habitat Degradation	3B
122	Winn Br.	5.0	Habitat Degradation	3B
191	Wolf Cr.	4.5	Habitat Degradation	3B
47	Wyaconda R.	42.2	Bacteria	2B
210	Yeater Br.	2.6	Habitat Degradation	3B
448	Zadie Cr.	5.3	Habitat Degradation	3B
479	Zounds Cr.	3.0	Habitat Degradation	3B

APPENDIX G – Responsiveness Summary

As described in Part E of this document, the Department provided several opportunities for the public to participate in the development of the 2016 LMD and 2014 Section 303(d) list. The public comment period for the proposed 2014 Section 303(d) List and 2016 LMD was opened on October 15, 2013 and closed January 31, 2014. During the public comment period, the Department held two public information sessions, and one public hearing. The Department responded to all pertinent questions and comments received during the public comment period.

Public comments received regarding the Section 303(d) List and the Department's responses are included here. Summaries of each availability session are also provided here. Public comments regarding the 2016 LMD will be posted to the Department's Section 303(d) List website (http://www.dnr.mo.gov/env/wpp/waterquality/303d.htm) at a later date.

Missouri
Department of
Natural Resources

Proposed 2014 303(d)
RESPONSES TO PUBLIC COMMENTS

Public Notice
October 15, 2013 – January 31, 2014

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Missouri Department of Natural Resources
Water Protection Program
PO Box 176
Jefferson City, MO 65102-0176
800-361-4827 / 573-751-1300

The Missouri Department of Natural Resources posted the draft 303(d) list for public comment. The Department accepted written comments from October 15, 2013 through January 31, 2014.

Below is a summary of the public comments received regarding the Proposed 2014 303(d) List of Impaired Waters. All original written comments will also be saved to the public administrative record file and available from the Department's website.

General 303(d) Listing Comments

St. Louis Metropolitan Sewer District (MSD)

> Submitted a comment that water bodies currently listed as impaired for water quality standards that are changing or may be changing in the near future (e.g., chloride, ammonia, losing stream bacteria, dissolved oxygen, and nutrients), should be considered a low priority for TMDL development.
>
> *MDNR Response and Action:*
>
> *Currently, the Total Maximum Daily Load (TMDL) program develops the TMDL schedule that is submitted to the U.S. Environmental Protection Agency (EPA) annually. This comment will be shared with the TMDL program staff.*

Newman, Comley and Ruth submitted the following comments:

> Encourages the Department and the Clean Water Commission to remove all proposed nutrient impaired lake listings from the 303(d) list in their entirety [including specific lakes exceeding nutrient criteria previously approved by the EPA]. The approved criterion is not science based and not tied to the attainment of beneficial uses.
>
> *MDNR Response:*
>
> *Table M of the 10 CSR 20-7.031 provides a list of twenty-five lakes that have site specific nutrient criteria. The proposed nutrient criteria for lakes, with the exception of Table M lakes, were disapproved by EPA. Currently, there are approximately 37 lakes that are proposed on the 2014 303(d) List of impaired waters. Twenty-eight of those lakes are listed as impaired for mercury in fish tissue, while nine lakes are listed for nutrient impairments (total nitrogen, total phosphorus and/or chlorophyll a). Because the Table M lakes maintain water quality criteria, the Department is required to complete water quality assessments on these waters.*
>
> The proposed 303(d) list has a column for the "pollutant" and "source." In some instances, the pollutant is unknown. In previous 303(d) lists, the Department used the term "unknown" under the pollutant column, but currently is including "fishes bioassessments" (see Buffalo Creek example). Fish bioassessments are a type of monitoring or test that is performed to support the impairment decision. In the case of bioassessments where the pollutant is sometimes unknown, the pollutant column should (at minimum) include the word "unknown" in the pollutant column as follows "Unknown – fishes bioassessment."
>
> *MDNR Response and Action:*

The Department agreed and revisions were made to the proposed 2014 303(d) List following the November 2013 Public Availability meeting to include "Unknown/Aquatic Macroinvertebrates Bioassessments - to the pollutant column. "Unknown" was also added to the four Fish Bioassessments proposed on the 2014 303(d) List.

303(d) listing should be supported by transparent, reproducible, and independently verifiable information and assessments of data quality. The information provided on the 303(d) listing worksheets for each impaired water body is insufficient to make an independent assessment of the quality of the data being used to support impairment determinations.

MDNR Response and Action:

The Department tries to present information in a clear, concise manner that allows for transparency. The Department agrees additional explanation could be added to the assessment worksheets, within the listing methodology document (LMD) and/or 303(d) web site.

Water quality data and aquatic macroinvertebrate data and reports can be accessed from the Department's website. This information has been available from the Department's website for a number of years, but may not been widely known or easily located. The web links have been provided here for reference and will be added to the LMD and 303(d) website.

- *Weblink to the Department's on-line searchable Water Quality Assessment Database. http://dnr.mo.gov/mocwis_public/wqa/waterbodySearch.do*
- *Weblink to the Department's Environmental Services Program, Water Quality Monitoring Section. From the below link, you will find links to Aquatic Macroinvertebrates Bioassessment Reports, and on-line database. http://dnr.mo.gov/env/esp/wqm/biologicalassessments.htm*

If information is unclear, the public may contact the Department for additional information through an Open Record Sunshine Request. Information on how to make an Open Records Request can be found on the Department's website: http://www.dnr.mo.gov/sunshinerequests.htm.

Water Body Specific Comments

Bee Tree Lake (WBID 7309)

MSD submitted a comment regarding the mercury impairment for Bee Tree Lake. They suggest since the mercury impairment results from atmospheric deposition and given the widespread nature of the problem and diffuse source, the Department should consider the development of a TMDL be low or medium priority.

MDNR Response and Action:

Currently, the TMDL program develops the TMDL schedule that is submitted to EPA annually. This comment will be shared with the TMDL program staff.

Big Creek (WBID 2673)

The Missouri Department of Conservation (MDC) submitted a comment regarding the 10% rule assessment on Big Creek. It was recommended, for consistency, the binomial method should be followed.

MDNR Response:

Big Creek was first listed as impaired during the 2012 listing cycle for low dissolved oxygen resulting from unknown sources. The initial listing was based upon 45 samples collected between 2000 and 2008 by the National Park Service. Since the original listing, additional samples have been collected providing a total of 63 samples to be utilized for data analysis. Twenty-four additional samples were collected between 2009 and 2011 (noting no exceedences within this time frame). Based upon the entire 87 sample data set (sample size greater than 30) the frequency of exceedence of the dissolved oxygen standard was less than 10%. Therefore, a binomial method was not required, and Big Creek was requested to be delisted.

Brush Creek (unclassified tributary), Blue River (WBID 0419 and 0418), Line Creek (WBID 3575), Shoal Creek (WBID 0397), East Fork Shoal Creek (WBID 0398), Wilsons Creek (WBID 2375), North Branch Wilsons Creek (WBID 3745), Jordan Creek (WBID 3374), and Jones Branch (unclassified tributary of Pearson Creek)

EPA submitted comments regarding the above streams stating urban stream monitoring completed by the U.S. EPA Region VII Environmental Services Division has identified streams that should be listed for toxic bottom sediments according to the state's methodology. Majority of the data is available on STORET and from KCWaters.org or can be provided by EPA.

MDNR Response:

The Department has downloaded the data provided by EPA into the Department's water quality assessment database. However, due to timing and receipt of the data, the Department does not have adequate time to assess the data and allow appropriate time for stakeholder review, discussion, and comment. The Department requests the assessment and/or listing of these streams be postponed until the 2016 listing cycle.

Center Creek (WBID 3203)

EPA submitted a comment regarding Center Creek stating the impairment for zinc is covered by a TMDL.

MDNR Response and Action:

The Department agrees. The information in the Department's database will be corrected for Center Creek and it will be removed from the proposed 303(d) list.

Chat Creek (WBID 3168)

EPA submitted comments on Chat Creek stating the TMDL proposed to delist the stream is for cadmium and not zinc. Therefore, this water body should remain on the 303(d) list for cadmium.

MDNR Response:

The data for Chat Creek was evaluated as per the 2014 LMD. There was only one exceedence of cadmium during stable flow conditions in the last three years of data, and thus it was not listed as impaired. However, the tributary that delivers most of the cadmium and zinc to Chat Creek is Baldwin Park Tributary, which is on the proposed 2014 303(d) List for cadmium.

Coldwater Creek (WBID 1706)

EPA submitted a comment regarding Coldwater Creek stating that not all available data was assessed. Additional chloride samples are available and should be included in the assessment. The chloride concentration on 2/21/2012 was 274 mg/L which exceeds the chronic water quality criterion. This data is available from the Department's website data search site (http://www.dnr.mo.gov/mocwis_public/wqa/waterbodySearch.do). With the sample taken on 1/5/2010 identified in the assessment spreadsheet for this water body, there was more than one exceedance of the chronic chloride criterion in the last three years.

MDNR Response and Action:

The Department agrees this was an assessment error. The additional chloride samples were included in the data set and reassessed.

Fox Creek (WBID 1842) and Dardenne Creek (WBID 0221)

EPA submitted a comment regarding Fox Creek asking if the unknown listing from 2012 is being replaced with an aquatic macroinvertebrate bioassessment.

MDNR Response:

Yes.

Grindstone Creek (WBID Hinkson1009), Hinkson Creek (WBID 1008), and Hominy Creek (WBID 1011)

The City of Columbia submitted a comment stating the data used by the Department to judge the streams as impaired for Grindstone Creek, Hinkson Creek and Hominy Branch to be old and does not believe the data is representative of current conditions due to

removal of five wastewater treatment plants from the watershed since 2004. In addition, the proposed 303(d) list assumes the sources of the pollutants (*E. coli*) are due to urban and rural nonpoint sources, and storm sewers. The City of Columbia states that since there is no solid proof of the sources, the sources should be listed as "unknown."

MDNR Response:

Grindstone Creek was first listed as impaired for E. coli during the 2006 listing cycle. A water body will be maintained on the impaired waters list until significant improvements have been completed in the watershed that addresses the impairment, and follow-up monitoring has been completed and data analysis indicates the beneficial use(s) is(are) now being met. At that time, the Department will request the water body be delisted.

Hinkson Creek was first listed as impaired for E. coli during the 2010 listing cycle. As previously discussed, a water body will be retained on the impaired waters list until significant improvements have been completed in the watershed that address the impairment, follow-up monitoring has been completed, and data analysis indicates the beneficial use(s) is(are) being met. At that time, the Department will request the water body be delisted.

Hominy Branch was first listed as impaired for E. coli during the 2012 listing cycle. As previously discussed, a water body will be maintained on the impaired waters list until significant improvements have been completed in the watershed that addresses the impairment, follow-up monitoring has been completed, and data analysis indicates the beneficial use(s) is(are) now being met. At that time, the Department will request the water body be delisted.

Please provide the Department with the date the wastewater treatment facilities were taken off-line along with their locations. If water quality data analysis indicates improvement resulting from the removal of these facilities, and the beneficial use is now being met, then the Department will request the water body be delisted for E. coli impairment during the 2016 listing cycle.

The presence of E. coli is an indicator of fecal contamination. E. coli is present in the intestines of warm blooded animals which is related to both point or nonpoint sources. In the absence of known point sources in the watershed, nonpoint sources are considered the major contributing factor to fecal contamination. Nonpoint source pollution can occur from several diffuse sources and cannot be pin-pointed to one single contributor. Aerial photos of the watershed are referenced to determine the major landuses contributing to the impairment.

As part of its adaptive management approach, the Department is currently collecting samples from all three of the aforementioned streams. The data collection efforts are still occurring and the data will be available and assessed during the 2016 listing cycle. To aid in the assessment process, the Department requests information regarding the management practices that have been implemented since these streams were initially listed as impaired. This will help the Department understand any improvements that may be indicated through data analysis and will provide added justification to request the water bodies be delisted for E. coli impairments.

Hays Creek (WBID 0097) and Dry Fork (WBID 3178)

EPA submitted comments regarding Hays Creek and Dry Fork. EPA reviewed the biological assessment worksheets and stated statistical significance was not calculated to show that reference streams in the same ecoregions were significantly larger. In addition, the state used control streams instead of the reference streams identified in Table I as directed in the state's water quality standards.

MDNR Response:

Over the last couple years, the Department has asked the lab (MDNR) biologist to monitor 2nd order to small 3rd order streams to gain a better understanding of an impairment or extent of impairment. These streams are often smaller than the reference streams listed in Table I of 10 CSR 20-7.031. In order to make an appropriate and accurate stream comparison, it is extremely important to assess small streams against others of similar size and features. Therefore, several small control streams are chosen based upon similar Valley Stream Types (VST) characteristics as the study stream. The Department biologist thoroughly reviews the VST database and ground-truths all the control streams. The Department is confident the lab (MDNR) biologists are competent, and are appropriately selecting control streams through thorough investigation and comparison using the best available methods (VST, ground-truthing, etc.).

Koen Creek (WBID 2171)

EPA submitted a comment on Koen Creek assessment worksheet. The 1995 EPA REMAP was discounted because of questions about its quality. This data should be considered valid. If there is no additional data to change the assessment, then this water should remain on the 303(d) list.

MDNR Response:

The Department chose not to use the REMAP fish community data because the collection method differed somewhat from the methods used by the RAM program, and the Department was concerned the differences may have had an effect on the IBI scores. The Department also had some concerns that despite being a third order stream, there was very little water in this stream most of the year.

Little Beaver Creek (WBID 1529)

EPA submitted a comment regarding Little Beaver Creek questioning if both sediment and macroinvertebrate community impairments should be on the 303(d) list.

MDNR Response:

There is significant amount of fine sediment deposition downstream of the Smith Sand and Gravel site, and the Department is assuming this is the reason for the low macroinvertebrate scores.

Little Blue River (WBID 0422)

The City of Independence submitted comments regarding the proposed listing for Little Blue River. It was mentioned that data collected by the USGS at 39th Street was not provided on the assessment worksheets and this data is available from the USGS website. In addition, the data summary sheet (assessment worksheet) indicates that a statistical procedure was used to adjust *E. coli* data to give greater weight to non-storm events,

given the USGS data set was biased toward stormwater influenced sampling. The city wanted to the let the Department know that extended periods of high flow can largely be attributed to the upstream reservoir releases, not stormwater runoff. Other information and comments provided by the city related to TMDL development considerations.

MDNR Response and Action:

The Department has re-assessed the water body to take into account the upstream reservoir releases mentioned. The Department also provided an explanation of the statistical adjustment procedures that were followed (the documents were provided to the city of Independence on 01/23/2014 via e-mail correspondence). The assessment outcome remains the same.

Regarding the USGS site at 39th Street: As mentioned, the Department will need to obtain this information from the USGS website. However, it will take a considerable amount of time to import the data into the Department's database and reassess within this public comment period. The Department would like to include this data during the 2016 assessment cycle. However, with that said, according to the LMD, the Department will conduct a bacteriological assessment on the most recent 3 years of data. Therefore, the addition of the site data from 39th Street between 2006-2009 will provide historical information, but will not be used for assessment purposes because of the availability of newer information.

North Fork Cuivre River (WBID 0170), Williams Creek (WBID 3594), Burris Fork (0968), Coldwater Creek (WBID 1706), Dardenne Creek (WBID 0221 and WBID 0222), Dark Creek (0690), Grand Glaize Creek (WBID 2184), Maline Creek (WBID 1709), Tributary to Big Otter Creek (WBID 1225), and Watkins Creek (WBID 1225).

The EPA submitted comments regarding the use of the binomial probability calculations for the above water bodies. EPA reviewed the assessment worksheets and stated the assessments conducted on the above water bodies were not consistent with the 2014 Listing Methodology Document procedures.

MDNR Response:

The Department has used the binomial probability distribution to assess the "ten percent rule" pollutants with more than 30 samples. The Department has done so because the binomial is a better method than a straight ten percent calculation.

The Department only uses the last three years of data when evaluating toxics, however, for "ten percent rule" pollutants, the Department uses older data as long as it appears to remain representative of current conditions. For instance, Coldwater Creek, the last three years of data were assessed for chloride, while the entire data set (182 data points) for dissolved oxygen was used for the assessment. MDNR requested clarification from EPA: Should the state be only looking at the last three years of data for the "ten percent rule" pollutants?

MDC submitted a comment regarding the delisting of Dardenne Creek (WBID 0221 and WBID 0222). It was recommended the new data be assessed using the binomial statistical method. MDC also recommends additional comprehensive dissolved oxygen monitoring be conducted.

MDNR Response:

Both water body segments were listed for low dissolved oxygen resulting from unknown sources.

- *Dardenne Creek WBID 0221 was originally listed as impaired during the 2010 listing cycle. The initial listing for WBID 0221 was based upon approximately 58 data points collected between 2000 and 2009. During the 2014 listing cycle, no additional data was available.*
- *Dardenne Creek WBID 0222 was originally listed during the 2006 listing cycle. The initial listing for WBID 0222 was based upon 52 data points collected between 2000 and 2005. For the 2008 listing cycle, approximately 25 additional data points were available for assessment (2006 and 2008). During the 2014 listing cycle, no additional data was available.*

Based upon the entire data set of each water body segment, it was determined that neither water body segment exceeded the 10% rule. Therefore, according to the 2014 LMD, the binomial method was not necessary.

Additional monitoring is scheduled for Dardenne Creek in the upcoming monitoring year, which will include dissolved oxygen measurements. The new data will be assessed to determine if conditions have changed since the last data collection efforts.

North Fork Cuivre River (WBID 0170)

EPA submitted a comment regarding North Fork Cuivre River data collected from WBID 0170. The data collected from the North Fork Cuivre River (WBID 0158) below the confluence with Indian Creek (WBID 0171) shows the North Fork Cuivre (WBID 0158) is not impaired, but it does not show just cause that the upstream segment of the North Fork Cuivre River (WBID 0170) is not impaired.

MDNR Response and Action:

The Department agrees. The North Fork Cuivre River (WBID 0170) will be removed from the proposed delist and retained on the 303(d) list of impaired waters list until additional data is collected.

Middle Fork of the Black River (WBID 2744)

Newman, Comley and Ruth provided a comment regarding the aquatic macroinvertebrate assessment. The listing worksheet indicated the impairment is based on crayfish densities at a site below Strother Creek. However, no assessment of the impact of habitat on crayfish density was presented. Sediment chemistry and water chemistry do not indicate impairment, a USGS study on Middle Fork sediments found 99 percent survival, and the invertebrate assessment was 17. The weight of evidence at this site points to attainment of aquatic life beneficial use, and the listing should be removed.

MDNR Response and Action:

The Department agrees, the crayfish data suggests possible impairment but the sediment and water chemistry do not indicate acute/chronic problems. The Department will place the Middle Fork of the Black River (WBID 2744) in Category 2B until additional data is available.

Newman, Comley and Ruth submitted a comment regarding the proposed listing of Strother Creek. The bioassessment worksheet was provided on the Department's website and wondered if the creek listing was in error.

MDNR Response and Action:

The Department inadvertently missed including the Strother Creek's macroinvertebrate assessment worksheet to the zip file located on the Department's website. Upon notification, the worksheet was added to the website and an electronic copy forwarded to the commenter via e-mail communication.

Peruque Creek (WBID 0217 and 0218)

EPA submitted a comment regarding the Peruque Creek delisting. EPA indicated the delisting for inorganic sediment is not accompanied by any data files showing inorganic sediment is no longer exceeding the narrative translator. In addition, there are no fish assessment data provided on the Department's website for the newly listed impairments on these two segments.

MDNR Response and Action:

The Department agrees. The sediment deposition worksheets will be included on the Department's 303(d) website. The Department did not include an assessment for the fish community because the Department does not have one. The listing for Peruque Creek was added to the list by the EPA and the rationale was included in their final decision document for one of the earlier 303(d) lists. The fish bioassessment replaces the inorganic sediment impairment.

Salt River below Clarence Cannon Dam (WBID 0091 and WBID 103)

The Department of Energy, Southwestern Power Administration submitted a comment regarding the proposed listing of the Salt River below Clarence Cannon Dam. The Southwestern Power Administration stated the lake stratification and watershed nonpoint source loading should be listed as causes of the low dissolved oxygen impairment in the Cannon Dam Re-Regulation Pool. They also request that the Department implement a site-specific dissolved oxygen water quality standard for the Cannon Dam Re-Regulation Pool that is seasonally lower than 5.0 mg/L.

MDNR Response and Action:

The Department believes that listing the dam as the source is a more general term that also includes the sources noted by the Southwestern Power Administration. The request for site specific criteria will be forwarded to our Water Quality Standards staff.

Table Rock Lake (WBID 7313)

The City of Branson submitted a comment regarding the county listed for Table Rock Lake. The proposed 303(d) list shows the county as "Taney County." However, only a

small portion of the lake is located in Taney County, and wondered if the county should be listed as "Stone County."

MDNR Response:

When we assign GPS (UTM) data points for impaired lakes we give the location of the dam. If only an arm of the lake is impaired, we would give the downstream point of the impairment and assume everything in the upstream direction from that point is impaired. Since the location of the dam is in Taney County, that county name is used.

Tiff Creek (WBID 3763)

MDC submitted a comment to suggest changing the delisting reason to be more consistent with the worksheet statement "suspected impairment – no habitat data."

MDNR Response and Action:

The Department agrees with your comment regarding the Tiff Creek delisting comment. The delisting comment will be revised to align with the statement provided on the 2014 assessment worksheet.

Troublesome Creek (WBID 0074)

EPA submitted comments on Troublesome Creek regarding the biological assessment worksheet. EPA states that sediment is itself a pollutant and if sediment is preventing the stream biota from meeting full compliance, the water body should be 303(d) listed for sediment.

MDNR Response:

The section of Troublesome Creek in question is in a lower gradient upland setting near the upper end of the watershed. This portion of the stream channel is developed in glacial till and will naturally have a significant amount of fine sediments regardless of current landuse. The Department views this as a natural condition of the stream that limits habitat quality, rather than a pollutant that can be abated. Because of this the Department believes it was appropriate to re-categorize Troublesome Creek as a category 4C.

Turkey Creek (WBID 3282)

EPA submitted a comment regarding the Turkey Creek assessment worksheet. The worksheet indicates impairment for lead in the water but not in the sediment.

MDNR Response:

The Department would like to clarify. There are two Turkey Creek assessment worksheets: one covering WBIDs 3216 and 3217 located in Jasper County, while the other WBID 3282 is located in St. Francois County. WBID 3216 and 3217 assessment worksheet provides information on the impairment for lead in sediment, and WBID 3282 assessment worksheet provides information on the impairment for lead in water.

Salt River (WBID 0103)

EPA submitted a comment regarding the Salt River to indicate there isn't a dissolved oxygen assessment sheet for this site.

MDNR Response and Action:

The WBID was changed to 7556 and it should have been noted on the new worksheet. This worksheet will be updated and reposted on the Department's 303(d) website.

Shibboleth Branch (WBID 2119)

EPA submitted a comment regarding Shibboleth Branch to indicate it has an EPA approved TMDL for lead and zinc in sediment. EPA provided a follow-up response stating they commented in error. The TMDL was approved for a different segment of Shibboleth Branch.

On 12/30/2013, EPA noted an error in their comments for Shibboleth Branch. The approved TMDL segment for Shibboleth Branch is located upstream of the proposed impaired segment.

Weatherby Lake (WBID 7071)

The Kessinger Law Firm submitted a comment regarding Weatherby Lake, stating it does not believe the lake should be classified as a water of the state because the Clean Water Act does not apply to this lake under 33 U.S.C §1315. Weatherby is an artificial private lake. There is no regular flow of water from the lake, and does not empty into any waters of the United States (above or beneath ground). It is believed the lake is not "navigable waters" as defined under the Clean Water Act.

The lake owners conduct private testing of its waters on a consistent basis to ensure the water quality. The tests of the Department that rely overwhelmingly on "nutrient data by the University of Missouri" from 1996-2010 which are likely inaccurate.

A request to the Department was made to remove the Weatherby Lake from the list of impaired waters, or as an alternative, provide information as to the Department's procedures to remove the Lake from the impaired waters list.

MDNR Response:

According to 10 CSR 20-7.031, Weatherby Lake is 185 acres and a Class L3 lake. According to 10 CSR 20-7.031, a Class L3 lake is defined as "Other lakes which are waters of the state. These include both public and private lakes." 10 CSR 20-7.031 further states Weatherby Lake has the following designated uses: Livestock and Wildlife Watering, Protection of Warm Water Aquatic Life, Human Health Fish Consumption, Whole Body Contact Recreation- Category A, and Secondary Contact Recreation. Additional information can be found within the 10 CSR 20-7.031. The Code of State Regulations is available electronically from the Missouri Secretary of State's website http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-7a.pdf.

Because Weatherby Lake is considered waters of the state with assigned beneficial uses, the Department is responsible for assessing the health of the lake to ensure the uses are meeting water quality standards. Table M of 10 CSR 20-7.031 provides information regarding the criteria set for specific lakes within the state. Weatherby Lake water quality criteria can be found in this table. The information has been summarized here for convenience.

Lake Ecoregion	*Lake*	*County*	*Site-Specific Criteria (ug/L)*		
			TP	*TN*	*Chl*
Plains	*Weatherby Lake*	*Platte*	*16*	*363*	*5.1*

As previously mentioned, Weatherby Lake data has been collected through the Lakes of Missouri Volunteer Program (LMVP) since 1998. The program is sponsored by the University of Missouri Columbia and supported by the Department. Data collection efforts are documented through a quality assurance project plan (QAPP) that is developed in accordance to EPA's requirements and guidance procedures. Additional information about QAPP procedures can be viewed from EPA's website: http://www.epa.gov/quality/qapps.html, http://www.epa.gov/quality/qapps.html. Data generated by the LMVP is shared with the Department.

If other water quality data of quality and quantity are available, the Department would like the opportunity to review the data. The data package, at minimum, should include the sample dates, time, site locations, field sample collection type: grab, depth integrated, composite, etc.), QC information (field and laboratory), sample collector training and experience, name of analytical lab, and methods and detection limits used during analysis.

Currently, the processes for removing the lake from the impaired waters list would include the implementation of land management practices or education outreach efforts to reduce nutrient inputs to the lake system. The process for removing the lake from the waters of the state designation is beyond the 303(d) listing process and will involve other Department staff.

West Fork of the Black River (WBID 2755)

Newman, Comley and Ruth submitted a comment regarding the proposed listing of the West Fork of the Black River. There are three different listing years under column "Year First Listed" for lead and nickel in sediment impairment, and therefore, would like the Department to explain the date discrepancies.

MDNR Response and Action:

Yes, the Department agrees. This is an error, and will be corrected to reflect that nickel in sediment was first listed in 2008, the same year that lead was also listed.

Additional comments were received regarding the assessment worksheets. A review of the sediment assessment worksheet data showed inconsistencies with information received during an open records request. Clarification was requested regarding several inconsistencies.

MDNR Response and Action:

The Department edited and re-assessed all sediment chemistry worksheets handling all duplicate samples in a consistent manner and recalculated averages as geomean. A summary of the updates were provided to the commenter via e-mail.

- *Bills Creek data was removed for it did not contain any nickel, lead, or zinc metals information (Manganese data only).*
- *All duplicate samples were merged per stream location to provide a single average sample value. The mean data are noted with an asterisk (*).*
- *Any previously missing data were included in the new assessment.*
- *The new assessment did not change the status of the water body.*

Wilsons Creek (WBID 2375), Jordan Creek (WBID 3374), and Pearson Creek (WBID 2373)

The City of Springfield and EPA submitted comments on the above streams for not being on the proposed list, nor was information available for these streams. EPA indicated the TMDL has been withdrawn so these waters again need a TMDL and should be relisted.

The City of Springfield indicates the age of the bacteria data for Pearson Creek is 9 to 13 years old. The city has recent data on Jones Branch, which indicates levels are good within this tributary and believes conditions have improved in Pearson Creek. The water body should be assigned to Category 2B or 3B and the potential impairment not include "urban runoff/storm sewers" as currently proposed.

The City of Springfield commented that Wilsons Creek was originally listed for bacteria impairment for losing stream protection in 2010 and contends the losing stream *E. coli* criterion is not scientifically supported.

EPA stated the TMDL for Wilsons, Jordan, and Pearson creeks has been withdrawn so these waters again need a TMDL and should be relisted.

MDNR Response and Action:

During the 1998 listing cycle Wilsons and Pearson creeks were listed as impaired for unknown pollutants from unknown sources. It was during the 2010 listing cycle when both of these steams were removed from the impaired list due to TMDLs developed by EPA. These TMDLs have since been withdrawn and, therefore, the waters returned to the 2014 303(d) list of impaired waters.

During the 2004/2006 listing cycle, both Wilsons and Pearson creeks were listed as impaired for bacteria. A water body will be maintained on the impaired waters list until significant improvements have been completed in the watershed that addresses the impairment listing or water quality data indicates improvements.

During the 2004/2006 listing cycle, Jordan Creek was impaired for low dissolved oxygen due to unknown reasons. It was during the 2010 listing cycle, Jordan Creek was removed from the impaired waters list due to the water body meeting water quality standards.

The City of Springfield also commented the toxicity data for Wilsons Creek is no longer representative of current conditions and conditions have greatly improved since the data were collected. In addition, the city states the Department should reevaluate habitat conditions for Wilsons, Pearson, and Jordan creeks. The city believes the study stream segments may be smaller than those of reference stream orders, and under Missouri's

new rule these sections of Wilsons, Jordan, and Pearson Creek will be classified as headwater streams.

MDNR Response:

The Department does not understand this concern at this time. Currently, Wilsons and Pearson creeks are not listed due to toxic conditions. However, as stated by EPA in a previous comment (page 3), EPA Region VII Environmental Services Division has recently identified streams [Wilsons Creek (WBID 2375), North Branch Wilsons Creek (WBID 3745), Jordan Creek (WBID 3374), and Jones Branch (unclassified tributary of Pearson Creek)] that should be listed for toxic bottom sediments according to the state's methodology. A majority of this data is available on STORET or can be provided by EPA.

EPA requested the Department assess this data for incorporation into the proposed 2014 303(d) list. The Department has downloaded the data provided by EPA into the Department's water quality assessment database. However, due to timing and receipt of the data, the Department did not have adequate time to assess the data and allow appropriate time for stakeholder review, discussion, and comment. The Department requests the assessment and/or listing of these streams be postponed until the 2016 listing cycle.

Whetstone Creek (WBID 1505U)

EPA submitted comments on Whetstone Creek to indicate the TMDL used to delist the creek was not approved for the upstream unclassified segment. The TMDL does not target a loading capacity which would result in meeting water quality standards.

MDNR Response:

The Department does not understand EPA's decision or statement for East Whetstone Creek 1505U (previous numbered as WBID 3964) and the justification for leaving this segment on the proposed 2014 303(d) list. The original TMDL allocated a point source ammonia load of zero pounds for this segment of the creek, which is currently impaired by ammonia solely by the Mountain Grove lagoon discharge. It would seem that correction of the problem lies in the setting and enforcing water quality based permit limits, not with correcting a deficiency in the TMDL.

Woods Fork (WBID 2429)

Newman, Comley and Ruth submitted comments regarding the proposed listing of Woods Fork. It was noted that the IBI score chart has a stream order of 1 and 2 with corresponding IBI scores for categories of unimpaired, inconclusive, suspected impairment and impairment. In previous meetings with MDC and MDNR, there was consensus that it is not appropriate to utilize fish IBI for first and second order streams. Therefore, why is this column included in the data sheet?

MDNR Response:

First through fifth order streams will be assessed when available data allows. Assessing all stream orders provides the Department an overall view of the health of a water. The

RAM data may be used to show 1st and 2nd order streams are unimpaired but the LMD does not allow use of the RAM data to rate these steams as impaired.

The bioassessment data sheet states that "a review of concurrent habitat scores indicate habitat was not impaired at the time of each fish survey." However, there was no habitat data/information included in the data sheet. It has been requested the Department revise and supplement its data sheets to include habitat data/information for both the test stream/study and local reference streams.

MDNR Response and Action:

The habitat scores for Woods Fork and reference streams were provided by MDC. The QCPH1 (habitat) scores were added to the assessment worksheet for Woods Fork (an electronic copy was provided to the commenter via e-mail communication).

EPA Comments to MoDNR on 2014 Draft 303(d) List

Bruce Perkins, Region 7 Integrated Reporting Coordinator
December 16, 2013
MDNR response provided via e-mail on January 21, 2014

In the assessment of causes like dissolved oxygen and pH; the binomial is only applicable when there are 30 or fewer samples according to the 2014 listing methodology. There are instances in the proposed delistings where this methodology is not followed. These include the North Fork Cuivre River (WBID 0170) and Williams Creek (WBID 3594). There are some water bodies where the binomial is used with greater than 30 samples but that there are less than 30 samples in the last three years and an application of the binomial shows the water body is meeting water quality standards for the last three years. These include Burris Fork (WBID 0968), Coldwater Creek (WBID 1706), Dardenne Creek (WBID 0221), Dardenne Creek (WBID 0222), Dark Creek (WBID 0690), Grand Glaize Creek (WBID 2184), Maline Creek (WBID 1709), Tributary to Big Otter Creek (WBID 1225) and Watkins Creek (WBID 1708).

- *The department has used the binomial to assess "ten percent rule" pollutants with more than 30 samples. The department has done so because the binomial is a better method than a straight ten percent calculation.*
- *The department only use the last three years of data when evaluating toxics, however, for the "ten percent rule" pollutants we use older data as long as it appears to remain representative of current conditions. For instance, Coldwater Creek, the last three years of data were assessed for Chloride, while the entire data set (182 data points) for Dissolved Oxygen was used for the assessment. Clarification: Should the state be only looking at the last three years of data for the "ten percent rule" pollutants?*

Hays Creek (WBID 0097) and Dry Fork (WBID 3178) Using watershed size to assess biological samples is allowed in the MO water quality standards [MO 10 CSR 20-7.031(4) (R)] where the size is not significantly different than reference streams in the same ecoregion. For these two streams the statistical significance was not calculated to show that reference streams in the same ecoregion were significantly larger. Additionally, for Hays Creek the state used control streams instead of reference streams identified in Table I as directed by the state's water quality standards.

- *Over the last couple years, the department has asked the (DNR) lab biologist to monitor 2nd order to small 3rd order streams to gain a better understanding of an impairment or extent of impairment. Since these streams are often smaller than what is stated in Table I of the MO water quality standards. In order to make an appropriate and accurate stream comparison, it is then extremely important to assess small streams against others of similar size and features. Therefore, several small control streams are chosen based upon similar Valley Stream Types (VST) characteristics as the study stream. Department biologist thoroughly review the VST database and ground-truth all the control streams. It important that streams of similar size are compared in order to accurately complete an accurate assessment. The department is confident the lab biologists are competent, and are appropriately selecting control streams through thorough investigation and comparison using the best available methods (VST, ground- truthing, etc).*

Urban stream sampling by the U.S. EPA Region 7 environmental services division has identified streams which should be listed for toxic bottom sediments according to the state's methodology. These include Brush Creek (Jackson County, unclassified tributary to Blue River, USGS Reach Code 10300101000565 and 10300101000566) for numerous PAH compounds (These findings are consistent with USGS studies performed in the earlier portions of the 2000's), Blue River (WBID 0419 and 0418), Line Creek (WBID 3575), Shoal Creek (WBID 0397) and East Fork Shoal Creek (WBID 0398) for cadmium, Wilsons Creek (WBID 2375) for lead and numerous PAH compounds, North Branch Wilsons Creek (WBID 3745) for zinc, Jordan Creek (WBID 3374) for numerous PAH compounds and Jones Branch (unclassified tributary to Pearson Creek, USGS Reach Code 11010002001683) for lead. This data is available in the EPA on-line data management program STORET. Data for Brush, Line, Shoal and East Fork Shoal creeks for the years 2010 and 2011 were not successfully uploaded to STORET and are included with this comment for consideration. The data is also available on the web site KCWaters.org.

- *The department has down loaded the data provided by the US EPA Region 7 into the department's water quality assessment database. However, due to timing and receipt of the data, the department does not have adequate time to assess the data and allow appropriate time for stakeholder review, discussion, and comment. The department requests the assessment and/or listing of these streams be postponed until the 2016 listing cycle.*

The TMDL for Wilsons, Jordan and Pearson creeks has been withdrawn so these waters again need a TMDL and should be relisted.

- *The departments TMDL unit agrees these waters should be relisted on the current 303(d) impaired waters list.*

For Troublesome Creek (WBID 0074) the habitat is stated as not being acceptable for the bioassessment to yield acceptable results. In this case one reason stated for poor habitat is sediment. Sediment is itself a pollutant and if sediment is preventing the stream biota from meeting full compliance, it would seem that the water body segment should be 303(d) listed for sediment.

- *Troublesome creek, the section in question is in a lower gradient upland setting near the upper end of the watershed. This portion of the stream channel is developed in glacial till and will naturally have a significant amount of fine sediments regardless of current landuse. Because of this, the department believes it was appropriate to re-categorize Troublesome Creek as a category 4c.*

The TMDL used to delist Whetstone Creek (WBID 1505U) was not approved for the upstream unclassified segment. The TMDL does not target a loading capacity which would result in meeting water quality standards. Further information on this can be obtained from the final EPA action on the 2012 Missouri 303(d) List where this water body was added back to the list.

- *The department does not understand EPA's decision or statement for East Whestone Creek 1505U (previous numbered as WBID 3964) and the justification for leaving this segment on the proposed 2014 303(d) list. The original TMDL allocated a point source ammonia load of zero pounds for this segment of the creek, which is currently impaired by ammonia solely by the Mountain Grove lagoon discharge. It would seem that*

correction of the problem lies in the setting and enforcing water quality based permit limits, not with correcting a deficiency in the TMDL.

The TMDL proposed to delist Chat Creek (WBID 3168) for cadmium was only approved for zinc. As such this water body should remain listed for cadmium.

- *The data for Chat Creek was evaluated as per the 2014 LMD. There was only one exceedence of cadmium during stable flow conditions in the last three years of data, and thus it was not listed. However, the tributary that delivers most of the cadmium and zinc to Chat Creek is Baldwin Park Trib which is on the proposed 2014303(d) list for cadmium.*

Fox Creek (WBID 1842), is the unknown listing from 2012 being replaced with the aquatic macroinvertebrate bioassessment new to the 2014 listing cycle?

- *This is correct*

Dardenne Cr (WBID 0221) does the Aquatic Macroinvertebrate bioassessment replace the unknown cause from 2012?

- *This is correct*

Koen Creek (WBID 2171), the data collected in 1995 was discounted because of questions about its quality. As the data was collected under the EPA REMAP program according to the EPA QAPP for data collection it should be considered valid if that program's requirements meet the state's methodologies. As such, if there is no additional data to change the assessment done for the 2012 list and this water should remain listed as impaired.

- *The department chose not to use the REMAP fish community data because the collection method differed somewhat from the methods used by the RAM program, and the department was concerned the differences may have had an effect on the IBI scores. The department also had some concerns that despite being a third order stream, there was very little water in this stream most of the year.*

For Coldwater Creek (WBID 1706) all available data was not assessed. The chloride concentration on 2/21/2012 was 274 mg/L which exceeds the chronic water quality criterion. This data is available from the state's web data search site (http://www.dnr.mo.gov/mocwis_public/wqa/waterbodySearch.do) With the sample taken on 1/5/2010 identified in the assessment spreadsheet for this water body, there were greater than one exceedance of the chronic chloride criterion in the last three years.

- *The department agrees this was an assessment error.*

The *E. coli* data used to delist the North Fork Cuivre River (WBID 0170) was collected in a different segment of the stream below the confluence with Indian Creek (WBID 0171). As such this shows North Fork Cuivre River (WBID 0158) is not impaired but does not provide good cause that the upstream segment is not impaired.

- *The department agrees.*

For Turkey Creek (WBID 3282) the assessment sheet indicates impairment for lead in water not sediment. Additionally, this water body was listed as impaired for lead in water for 2012.

- *The department would like to clarify. There are two Turkey Creek assessment worksheets: one covering WBIDs 3216, 3217 located in Jasper County, while the other WBID 3282 is located in St. Francois County. WBID 3216 and 3217 assessment worksheet provides information on the impairment for lead in sediment, and WBID 3282 assessment worksheets provides information on the impairment for lead in water.*

Peruque Creek (WBID 0217 and 0218) The delisting of inorganic sediment is not accompanied by any data files that show the inorganic sediment is no longer exceeding the narrative translator. MDNR water quality data search does not indicate that any new sediment samples have been collected since the 2012 list. Additionally, there is no fish assessment data provided on the review web site for the new listed impairment for these two segments.

- *The department agrees, the sediment deposition worksheets will be included on the department's 303(d) website.*
- *The department did not include an assessment for the fish community because the department does not have one. The listing for Peruque Creek was added to the list by the USEPA Region 7 and the rational was included in their final decision document for one of the earlier 303(d) lists. The fish bioassessments replaces the inorganic sediment impairment.*

Center Creek (WBID 3203) The impairment for zinc is covered by a TMDL.

- *The department agrees. The information in our database will be corrected for Center Creek and it will be removed from proposed 303(d) list.*

Little Beaver Creek (WBID 1529) Is the sediment impairment being used as a pollutant for the macroinvertebrate community impairment. Should it be listed for both?

- *There is significant amount of fine sediment deposition downstream of the Smith Sand and Gravel site, and the department is assuming this is the reason for the low macroinvertebrate scores.*

Salt River (WBID 0103) No DO data in assessment sheet for this site.

- *The WBID was changed to 7556 and it should have been noted on the new worksheet. This worksheet is available on the department's 303(d) website.*

Shibboleth Branch has an EPA approved TMDL for lead and zinc in sediment and need not be listed in category 5 (303(d)) but category 4a (TMDL).

- *A TMDL was developed for Shibboleth Branch WBID 2120, while the current listing is for WBID 2170 for Lead and Zinc due to mill tailings.*
- *On 12/30/2013, EPA noted an error in their comments for Shibboleth Branch. The approved TMDL segment for Shibboleth Branch is located upstream of the proposed impaired segment.*

Is there an available site where WBIDs and the water body are identified and geolocated up to date with this proposed list?

- *http://www.dnr.mo.gov/internetmapviewer/makemap.map Hyperlinks are also available on the proposed 2014 list (http://dnr.mo.gov/env/wpp/docs/2014-303d-list-pnp.pdf).*
- *The hyperlinks link out to the department's interactive mapping system for each impaired water listing. By clicking the identifier icon it provides additional information about the data, including the WBID.*

Summary of First Public Information Session

Date: November 13, 2013
Time: 10:00 am to 3:00 pm
Meeting: Public Availability Session
Subject: Proposed 303(d) listing and 2016 Listing Methodology Meeting Notes
Attendees:

Trish Rielly, MoDNR	trish.rielly@dnr.mo.gov	573-526-5297
Jennifer Hoggatt, MoDNR	jennifer.hoggatt@dnr.mo.gov	573-761-1403
John Ford, MoDNR	john.ford@dnr.mo.gov	573-751-7024
Lynn Milberg, MoDNR	lynn.milberg@dnr.mo.gov	573-526-4681
John Hoke, MoDNR	john.hoke@dnr.mo.gov	573-526-1446
Leslie Holloway, Missouri Farm Bureau	lholloway@mofb.com	573-893-1409
Robert Brundage, Newman, Comley, & Ruth	rbrundage@ncrpc.com	573-634-2266
Michele Gremminger, City of O'Fallon	micheleg@ofallon.mo.gov	636-379-7632

The public availability session was set up as an informal meeting to allow stakeholders the opportunity to provide comments or questions relating to the proposed 2014 303(d) list and the 2016 Listing Methodology Document (LMD).

A few clarifying questions were asked regarding streams proposed for delisting, what information was used to delist, and if selected streams were scheduled for additional monitoring. For the streams in question that were proposed for delisting, all were originally listed based upon fish Index of Biotic Integrity (IBI) scores. Of these streams, the majority proposed for delisting were due to the lack of habitat data: 1) If there was a lack of habitat data to accompany the fish IBI scores, the water body was not assessed 2) if the water body had low habitat score (below 0.39) the water body was not assessed.

Discussions occurred regarding newly listed streams and what had caused them to be listed during this listing cycle and not previous cycles. For the streams of interest, the water quality assessment sheets were reviewed which indicated new water quality data was available and was used during this current listing cycle.

Many stakeholder questions and comments related to the bioassessment work group discussions, decisions, or unresolved issues. The main questions were related to how fish IBI scores were assessed in relation to poor habitat and how many streams were added to the list of impaired waters based upon the assessment procedures that were followed. Much discussion occurred between stakeholders and department staff who had been involved in the bioassessment work group. The department plans to use the scores recommended by the biologist for the 2016 LMD. By following this process, one additional stream would have been added to the impaired waters list had this process been used for the 2014 303(d) list.

Other discussions relating to bioassessment workgroup topics (Issue 5) were unresolved: would a stream be listed as impaired based upon one taxonomic group? Overall, numeric water quality

standards would be used to support an impairment decision. However, biological community information and other numeric translators of general criteria would be used when numeric criteria are available or when general criteria indicate impairment.

Clarifying statements were suggested to be added to the proposed 2016 listing methodology document, along with a summary of changes that had occurred. Participating stakeholders were asked to provide examples of preferred wording.

Clarification was provided that fish IBI scores are only used for Ozarks streams. Until other fish IBI metrics are developed for the other ecoregions, only Ozarks streams will be assessed using this method. Information was provided to members of the bioassessment workgroup who were present. The information summarized how fish IBI and habitat data were evaluated and used during the 2014 assessment process. Discussion continued for specific streams of concern to determine if the impairment was due to habitat or other issues. A follow-up e-mail was sent out to the workgroup later in the day to provide information on the listing process for Ozark streams, and how habitat and low flow concerns were addressed. Additional information describing the fish bioassessment process was recommended to be added to the proposed 2016 listing methodology document.

Stakeholders suggested updating portions of the 303(d) list of impaired waters table to provide a clearer understanding of what the table is stating. The department may be limited on what information can be updated and/or changed since the table is formatted to match EPA's database requirements.

A stakeholder stated the Quality Assurance/Quality Control (QA/QC) data needs to be available to help make sense of the data. A general overview of the department's process was provided to help explain the various levels of QA/QC utilized by the department. Information provided on the Chemical Analysis results sheets was discussed, and how information is reviewed to determine validity of data. In addition, the department also has established Quality Assurance Program Plans and Standard Operating Procedures that are followed to ensure quality data is generated.

In closing, the stakeholders were asked to follow–up in writing with specific questions they would like addressed. By doing so, their questions and comments become part of the department's administrative record for these efforts.

Summary of Second Public Information Session

Date: December 11, 2013
Time: 10:00 am to 3:00 pm
Meeting: Public Availability Meeting
Subject: Proposed 303(d) listing and 2016 Listing Methodology Meeting Notes
Attendees:

Barbara Yates, Missouri Sierra Club and River Bluff Audubon Society		
Dan Reed, Missouri Sierra Club and River Bluffs Audubon Society		
	dan.reed@hotmail.com	573-634-2599
David Shanks, Boeing	david.l.shanks@boeing.com	314-777-9227
Gary Buford, Boeing	gary.s.buford@boeing.com	314-777-1403
Jennifer Hoggatt, MoDNR	jennifer.hoggat@dnr.mo.gov	573-751-1403
Mary Culler, MoDNR	mary.culler@dnr.mo.gov	660-385-8000
Randy Crawford, Geosyntec Consulting	rcrawford@geosyntec.com	573-443-4100
John Ford, MoDNR	john.ford@dnr.mo.gov	573-751-7024
Kirk Lambrecht, MoDNR	kirk.lambrecht@dnr.mo.gov	573-526-6802
Trish Rielly, MoDNR	trish.rielly@dnr.mo.gov	573-526-5297
Robert Brundage, Newman, Comley & Ruth	rbrundage@ncrpc.com	573-634-2266
Holly Neill, Stream Team Watershed Coalition	hollyneill@nstwc.org	800-781-1989
Robert Voss, MoDNR	robert.voss@dnr.mo.gov	573-522-4505

The public availability session was set up as an informal meeting to allow stakeholders the opportunity to provide comments or questions relating to the proposed 2014 303(d) list and the 2015 Listing Methodology Document (LMD).

Several attendees stated they were interested in learning more about the 303(d), LMD processes and what happens to a waterbody after it has been listed as impaired. Therefore, a summary of the history of Section 303(d) of the Clean Water Act and requirements were provided and discussed. In addition a general explanation of Missouri's monitoring and assessment activities and processes were described.

An overview of the proposed 2014 303(d) list and 2016 LMD was provided. The proposed 303(d) list overview focused on the number of new waterbodies added to the list, the top 5 pollutants, and causes, while a summary of the LMD focused on specific and/or major revisions.

A majority of the specific questions directly relating to the proposed 2016 LMD, were related to the bioassessment work group discussions, decisions, or unresolved issues. The main questions related to the habitat scores and how they were derived for invertebrates and fish (aquatic macroinvertebrate 75% of reference threshold and 0.39 QCPH1 score). Stakeholders asked if supporting documentation could be provided to support threshold decisions. Habitat questions relating to aquatic macro invertebrates, follow-up information was provided directly to the stakeholder who had initiated the question. The information can also be referenced from the Departments standard operating procedures. Questions relating to Fish IBI habitat scores, where

directed to the Missouri Department of Conservation. Once information has been received, it will be provided to the participating stakeholder(s).

A stakeholder the Department is solely responsible for creating the list of impaired waters, and at times the Department relies or defers to other state agencies to make a decision about an impairment. It was explained, in instances where the Department relies on others outside our agency to provide environmental data (e.g. fish community), the Department may also seek assistance of others that may have more experience with analysis of certain types of data.

Clarification regarding Site Specific Nutrient Criteria was provided. At this time, only those lakes provided in Table M of the 10 CSR 20-7.031 are assessed for nutrients and chlorophyll a.

In closing, the stakeholders were asked to follow-up in writing with specific questions they would like addressed. By doing so, their questions and comments become part of the Departments administrative record for these efforts.